

# STATE OF UTAH DEPARTMENT OF PUBLIC SAFETY



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## OFFICIAL VEHICLE SAFETY INSPECTION MANUAL FOR TRACTORS / TRAILERS / BUSES 26,001 lbs GVWR AND ABOVE 2009-2010



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## **DEPARTMENT OF PUBLIC SAFETY**



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# **OFFICIAL VEHICLE SAFETY INSPECTION MANUAL**

## **FOR**

### **TRACTORS /TRAILERS/ BUSES**

### **26,001 lbs GVWR AND ABOVE**

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**EFFECTIVE** January 01, 2009- December 31, 2010

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## **Table of Contents**

<b>INTRODUCTION.....</b>	<b>1</b>
<b>VEHICLE SAFETY INSPECTION PROCEDURES .....</b>	<b>2</b>
<b>REQUIRED EQUIPMENT LIST.....</b>	<b>5</b>
<b>SECTION 1- REGISTRATION .....</b>	<b>7</b>
A.    AGREEMENT AMONG PAPERS .....	7
B.    PLATE MOUNTING.....	7
<b>SECTION 2-TIRES AND WHEELS .....</b>	<b>8</b>
A.    REAR WHEEL MUDGUARDS .....	8
B.    FRONT STEERING AXLE TIRES .....	8
C.    ALL OTHER TIRES .....	10
D.    DUAL TIRES .....	10
E.    TIRE SIZE .....	11
F.    VALVE STEMS.....	11
G.    RIMS, RINGS, NUTS, CLAMPS, STUDS, WHEELS.....	11
<b>SECTION 3-STEERING ALIGNMENT AND SUSPENSION .....</b>	<b>13</b>
A.    STEERING WHEEL LASH (Free Play).....	13
B.    STEERING COLUMN.....	14
C.    SIZE.....	14
D.    FRONT AXLE BEAM.....	15
F.    PITMAN ARM.....	15
G.    POWER STEERING.....	16
H.    BALL AND SOCKET JOINTS .....	16
I.    TIE RODS AND DRAG LINKS .....	17
J.    STEERING SYSTEM .....	19
K.    STEERING LINKAGE, KINGPIN, SPRINGS .....	19
L.    LEAF SPRING SUSPENSIONS.....	20
M.    ALL OTHER SUSPENSION.....	20
N.    TORQUE, RADIUS OR TRACKING COMPONENTS .....	21
O.    WHEEL TRACKING .....	21
<b>SECTION 4- COUPLING DEVICES .....</b>	<b>22</b>
A.    FIFTH WHEEL.....	22
B.    PINTLE HOOKS .....	23
C.    DRAWBAR / TOW-BAR EYE.....	24
D.    DRAWBAR / TOW-BAR TONGUE.....	24
E.    SAFETY DEVICES.....	24
F.    FIFTH WHEEL DIAGRAMS .....	25
G.    PINTLE HOOKS DIAGRAM .....	26
H.    DRAWBAR DIAGRAMS .....	26
I.    UPPER FIFTH WHEEL PLATE AND KINGPIN DIAGRAM .....	27
J.    CONVERTER DOLLY DIAGRAM .....	27

<b>SECTION 5 – BRAKES .....</b>	<b>28</b>
A. CHECK BRAKE SYSTEM ON ALL VEHICLES .....	29
B. PARKING BRAKE SYSTEM .....	30
C. BRAKE DRUM AND ROTORS .....	30
D. BRAKE HOSES .....	31
E. BRAKE TUBING .....	31
F. LOW PRESSURE WARNING DEVICE .....	32
G. TRACTOR PROTECTION VALVE (DEVICE) .....	32
H. AIR BRAKES / COMPRESSOR .....	32
I. ELECTRIC BRAKES AND BREAKAWAY BRAKING DEVICE .....	32
J. HYDRAULIC BRAKES .....	33
K. VACUUM BRAKING SYSTEMS .....	34
L. WHEEL SEALS .....	34
M. BOLT TYPE (Dimension in Inches) .....	34
N. ROTOCHAMBER TYPE- (Diameter in Inches) .....	35
O. CLAMP TYPE-(Diameter in Inches) .....	35
P. LONG STROKE CLAMP TYPE BRAKE .....	36
Q. STEERING AXLES .....	36
R. NON STEERING AXLES .....	36
<b>SECTION 6-ELECTRICAL SYSTEMS .....</b>	<b>43</b>
A. HORN .....	43
B. ELECTRICAL .....	43
C. ELECTRICAL WIRING .....	43
D. ELECTRICAL CONNECTIONS .....	43
E. AUTOMATIC TRANSMISSIONS STARTING SWITCH .....	44
<b>SECTION 7 – LIGHTING SYSTEM .....</b>	<b>45</b>
A. ALL ORIGINAL EQUIPMENT LIGHTS MUST BE OPERATIONAL .....	45
C. LIGHTING CHART-(LIGHTS REQUIRED ON ALL VEHICLES) .....	47
D. REQUIRED ON ALL VEHICLES 80" OR WIDER .....	48
<b>SECTION 8 - EXHAUST SYSTEM .....</b>	<b>49</b>
A. EXHAUST SYSTEM .....	49
<b>SECTION 9 - FUEL SYSTEM .....</b>	<b>51</b>
A. DIESEL / GASOLINE / LPG / NATURAL GAS .....	51
<b>SECTION 10-VEHICLE INTERIOR .....</b>	<b>56</b>
A. SEATS AND SEAT BELTS .....	56
B. FLOOR PAN .....	56
C. FRAME .....	56
D. WINDSHIELD WIPERS .....	57
E. WINDSHIELD WASHER SYSTEM .....	57
F. WINDSHIELD DEFROSTER .....	57
G. SPEEDOMETER / ODOMETER .....	58
<b>SECTION 11-VEHICLE EXTERIOR .....</b>	<b>59</b>
A. PROTRUDING METAL / PARTS AND ACCESSORIES .....	59
B. BUMPERS .....	59
C. FENDERS .....	59
D. DOORS .....	60
E. HOOD / LATCH .....	60
F. EXTERIOR REARVIEW MIRROR(S) .....	60
G. MOTOR MOUNTS / TRANSMISSION MOUNTS .....	61



<b>SECTION 12-WINDOWS AND GLAZING.....</b>	<b>62</b>
A.    WINDSHIELD.....	62
B.    VEHICLE GLAZING .....	64
C.    LEFT OR RIGHT FRONT WINDOWS .....	64
<b>SECTION 13- SCHOOL BUS .....</b>	<b>65</b>
<b>REFERENCE CHART.....</b>	<b>68</b>
<b>DEFINITIONS .....</b>	<b>64</b>
<b>Index by Subject.....</b>	<b>71</b>

**\*\*\* All changes from the 2008 Manual to the 2009-2010 Manual have been underlined and highlighted for your convenience. \*\*\***

## INTRODUCTION

The Utah Highway Patrol-Vehicle Safety Inspection office has compiled this manual from many different sources.

- The American Association of Motor Vehicle Administrators (AAMVA)
- Vehicle Inspection Subcommittee of the American Automobile Manufacturers Association (AAMA)
- National Highway Traffic Safety Administration (NHTSA), provides information relating to various FMVSS standards that can be found at this website [www.nhtsa.gov](http://www.nhtsa.gov).
- The Utah State Criminal and Traffic Code
- Federal Motor Vehicle Safety Standards (FMVSS)
- Commercial Vehicle Safety Alliance (CVSA), and the Code of Federal Regulations (CFR's).
- In addition, the Safety Inspection office is advised by the Motor Vehicle Safety Inspection Advisory Council on the adoption and implementation of Safety Inspection Standards.

This manual meets the requirements established under 41-6a-1601 for setting the minimum standards covering the design, construction, condition and the operation of vehicle equipment for safely operating a motor vehicle on highways. These rules are made in accordance with Title 63G Chapter 3, Utah Administrative Rulemaking Act, and in coordination with the rules made under Section 53-8-204.

This manual contains minimum standards relating to motor vehicle safety. It is expected that individual inspectors, inspection managers, fleet inspection stations and public inspection stations involved with the Safety Inspection program be familiar with this manual. Every effort has been made to provide specific inspection recommendations and procedures that will allow for the safe operation of motor vehicles on Utah's highways. Please visit our website at <http://safetyinspections.utah.gov>.

The Safety Inspection staff is committed to the safety of the motoring public. We recognize that those involved with the Safety Inspection Program are also concerned with vehicle safety. Safety Inspection continues to review its operating policies and procedures. Utah law requires the Safety Inspection office to "investigate complaints" and to protect consumers from "unwanted or unneeded repairs or adjustments", 53-8-204 UCA. To protect the integrity of the Safety Inspection program, those who violate these provisions will be dealt with both civilly and criminally.

Safety Inspection encourages all those who participate in this program to become familiar with these rules. This program is only successful with the cooperation and determination of the many stations and inspectors found throughout the state. Safety Inspection looks forward to any comments, concerns or questions that may arise in carrying out our objective of safer vehicles for Utah's highways.

This manual supersedes all previous manuals and shall be used in determining the pass/fail condition of vehicle equipment. Utah's Safety Inspection program meets the Federal Motor Carrier Safety Regulations as required in appendix G for yearly annual inspections. See Appendix G, Federal Motor Carrier Safety Regulations.

## **VEHICLE SAFETY INSPECTION PROCEDURES**

### **A. INITIATING THE INSPECTION**

1. Request registration paperwork. (Vehicles may be inspected without registration paperwork.)
2. Verify vehicle identification number (VIN.)
3. Write the date of inspection on the inspection affidavit.
4. Write owner and vehicle information on inspection affidavit.
5. Vehicle mileage must be recorded.
6. Inspectors must write their inspector number in the appropriate box.
7. Inspectors may not sign the affidavit until the vehicle passes the vehicle inspection process.
8. Remove old inspection sticker.

### **B. INSPECT VEHICLE INTERIOR**

1. Inspect for impaired visibility through windshield.
2. Inspect for adequate visibility from required mirrors.
3. Inspect seatbelts for proper operation.
4. Inspect for looseness in steering.
5. Inspect for play in brake pedal.
6. Inspect emergency brake for proper operation.
7. Inspect horn. Horn must be audible at 200 feet.
8. Inspect windshield wiper / washer operations.
9. Inspect heater/defroster operation.

## **VEHICLE SAFETY INSPECTION PROCEDURES - Continued**

### **C. INSPECT VEHICLE EXTERIOR**

1. Inspect high and low beam headlights.
2. Inspect headlights for proper aim.
3. Inspect parking lights, tail lights, signal lights, brake lights, marker lights and reflectors.
4. Inspect for the proper color of lights.
5. Inspect tires for proper inflation, wear and damage.
6. Inspect body, fenders, door, hood latches and bumpers
7. Inspect for broken glass.
8. Inspect window tinting. Measure light transmittance on front side windows and windshield.

### **D. INSPECT UNDER HOOD**

1. Inspect belts.
2. Inspect hoses.
3. Inspect power steering pump.
4. Inspect wiring.
5. Inspect exhaust manifold.
6. Inspect master cylinder.
7. Inspect for fuel leaks.
8. Inspect air compressor.

## **VEHICLE SAFETY INSPECTION PROCEDURES – Continued**

### **E. INSPECT SUSPENSION AND UNDERCARRIAGE**

1. Inspect wheel bearings.
2. Inspect ball joints.
3. Inspect tie rod ends.
4. Inspect idler arms.
5. Inspect shock absorbers.
6. Inspect springs.
7. Inspect exhaust system.
8. Inspect floor pans.
9. Inspect fuel system lines.

### **F. INSPECT WHEELS AND BRAKES**

1. Inspect for loose or missing lug nuts.
2. Inspect for cracked wheels.
3. Inspect pads and/or shoes.
4. Inspect rotors and/or drums.
5. Record brake measurements on the inspection certificate.
6. Inspect for fluid leaks.
7. Inspect brake hoses.

### **G. COMPLETING THE INSPECTION**

1. Inspector must sign the affidavit.
2. Apply new sticker to inspected vehicle.

## REQUIRED EQUIPMENT LIST

### A. Tractor / Trailer / Buses Requirements:

1. Headlight Aiming Device (optical, or screen)
2. Hoist
3. Light Meter (2 piece approved by division) \*(See Required Equipment List, Section D)
4. Hand Tools (wrenches, screwdrivers, ratchets, etc.)
5. Dial Indicator (for measuring ball joint and suspension component tolerances.
6. Tire Tread Depth Gauge\*
7. Current Safety Inspection Manual
8. Tire Pressure Gauge
9. King Pin Gauge
10. Fifth Wheel Jaw Tester
11. Measuring Tape
12. Current Federal Motor Carrier Safety Regulations (FMCSR) Manual
13. Current School Bus Standards and Inspection Manual. (Only required if inspecting school buses)

### B. Brake Gauges

1. Bonded
2. Riveted\*
3. Disc Pad
4. Rotor
5. Large Drum

### C. Tools can be purchased from any company that manufactures these types of tools.

**\*NOTE: *Riveted brake lining gauge can be used for tire tread depth gauge or vice versa.***

## **REQUIRED EQUIPMENT LIST – Continued**

D. Department approved 2 piece light meters can be ordered from any of the following:

1. Advanced Design Systems Light Meter  
Autoequipmentonline.com / Swis Automotive & Truck Equip.  
1-800-971-0924
2. LASER LABS  
Laser-labs.com  
1-800-452-2344
3. Laser Labs 200  
Tools Unlimited, Salt Lake City  
1-801-487-9839
4. Pocket Detective Light Meter  
Monroe (PMP) Pro Motor Car Products  
promotorcarproducts.com  
1-800-440-3967

## **SECTION 1- REGISTRATION**

The first step in the inspection of a vehicle is a review of the registration papers. Vehicles with out-of-state registration or vehicles with no registration can be inspected. These requirements apply to passenger cars, light trucks, motorcycles, heavy trucks, trailers, and buses.

### **A. AGREEMENT AMONG PAPERS**

1. Check vehicle registration certificate, identification number on vehicle, license plates and vehicle description for agreement. Record the manufacturers VIN and license plate number on the safety inspection affidavit.
  - a. **ADVISE** when:
    - 1) Paperwork disagreements are accidental or clerical in nature.
  - b. **REJECT** when:
    - 1) Registration certificate, identification number, license plate or vehicle description is not in agreement.
    - 2) **Vehicle Identification Number is missing or obscured.**

***\*NOTE: Verification of VIN is required on all inspections.***

### **B. PLATE MOUNTING**

1. If the vehicle is registered, inspect the license plate(s) to see that they are securely mounted and are clearly visible.
  - a. **ADVISE** when:
    - 1) Plates are not securely fastened, obscured or cannot be clearly identified.
    - 2) Plates have tinted or colored covers.
    - 3) License plates must be visible from 100 feet.  
(UCA 41-1a-403 and 41-1a-404)

***\*NOTE: Utah Apportioned plates are issued only one license plate. Truck tractors should mount the Apportioned plate on the front. Trucks without trailers should mount the apportioned plate on the rear.***



## SECTION 2-TIRES AND WHEELS

### A. REAR WHEEL MUDGUARDS

1. Check vehicle for proper mudguard protection. Mudguards, flaps, or splash aprons shall: be at least as wide as the tires they are protecting, be directly in line with the tires, and maintain a ground clearance of not more than 50% of the diameter of a rear-axle wheel, under any conditions.

a. **REJECT** when:

- 1) Tire tread is not fully covered by body, trailer or fender.
- 2) Rear tires do not have the top 50% of the tire covered by mud flaps.
- 3) Rear mud flaps are not as wide as the tire.

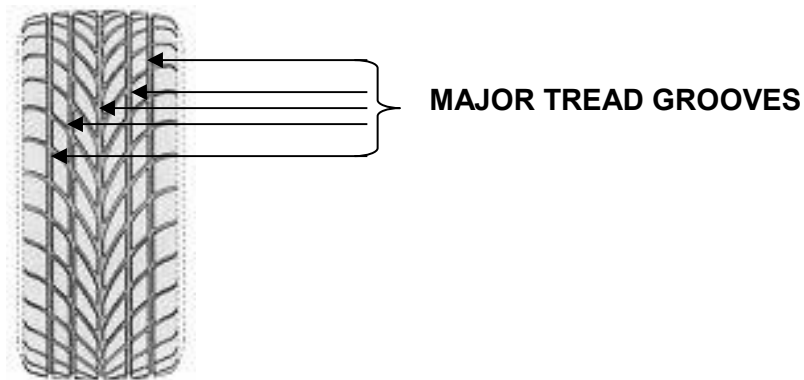
**\*NOTE:** *Wheel covers; mudguards, flaps or splash aprons are not required if the motor vehicle, trailer, or semi-trailer is designed and constructed so that it meets the above requirements. (UCA 41-6a-1633)*

### B. FRONT STEERING AXLE TIRES

1. Check tire tread depth.

a. **REJECT** when:

- 1) Tread depth is less than 4/32 inch on steering axle tires when measured in any two adjacent major tread grooves at three equally spaced intervals around the circumference of the tire. UCA 41-6a-1636 (7)(ii) (Do not measure on a tread wear bar)



## **TIRES AND WHEELS - Continued**

2. Check tire condition and inflation

a. **REJECT** when:

- 1) Tire is cut or otherwise damaged exposing body ply or belt material through the tread or sidewall.
- 2) Tire has any tread or sidewall separation.
- 3) Tire is labeled for other than highway use or displaying other markings which would exclude use on a steering axle.
- 4) Tire is a tube-type radial tire without radial tube stem markings. These markings include a red band around the tube stem, the word "radial" embossed in metal stems, or the word "radial" molded in rubber stems.
- 5) There is mixing of bias and radial tires on the same axle.
- 6) Tire flap protrudes through valve slot in rim and touches stem.
- 7) There are re-grooved tires on the steering axles.
- 8) Tire has a boot, blowout patch or other ply repair.
- 9) Weight carried exceeds tire load limit. This includes overloaded tire resulting from low air pressure.
- 10) Tire is flat or has noticeable leak (e.g., can be heard or felt), or are inflated to less than half (50%) of the vehicle manufacturer's recommended tire pressure.
- 11) Any bus equipped with re-capped or re-treaded tire(s).
- 12) So mounted or inflated that it comes in contact with any part of the vehicle.
- 13) Tire is over inflated.
- 14) Tire is worn to the extent secondary rubber is exposed in the tread or sidewall area.

## **TIRES AND WHEELS - (Continued)**

### **C. ALL OTHER TIRES**

1. Check tire tread depth.

**a. REJECT when:**

- 1) Tread depth is less than 2/32 when measured in any two adjacent major tread grooves at three equally spaced intervals around the circumference of the tire. UCA 41-6a-1636 (7)(ii) (Do not measure on a tread wear bar)

2. Check tire condition and inflation.

**a. REJECT when:**

- 1) Weight carried exceeds tire load limit. This includes overloaded tire resulting from low air pressure.
- 2) Tire is flat or has noticeable leak (e.g., can be heard or felt), or are inflated to less than half (50%) of the vehicle manufacturer's recommended tire pressure.
- 3) Tire is cut or otherwise damaged exposing body ply or belt material through the tread or sidewall.
- 4) Has any tread or sidewall separation.
- 5) So mounted or inflated that it comes in contact with any part of the vehicle. (This includes a tire that contacts its mate.)
- 6) Tire is labeled for other than highway use or displaying other markings which would exclude use.
- 7) Tire is worn to the extent secondary rubber is exposed in the tread or sidewall area.

### **D. DUAL TIRES**

1. Check for mismatching of tire construction (i.e. radial and bias), sizes, and wear on any set of duals.

**a. REJECT when:**

- 1) Tire diameter of one of the duals is not within 1/4 inch of the other on 8.25-20 and smaller, or 1/2 inch on 9.00-20 and larger.
- 2) Duals are found to be in contact with any part of vehicle body or adjacent tire.

## **TIRES AND WHEELS - (Continued)**

### **E. TIRE SIZE**

1. Check for proper tire width, size and load rating.
  - a. **REJECT** when:
    - 1) Tire width is beyond the outside of the vehicle body.
    - 2) Tire is not of the proper size and load rating per axle as determined by OEM specifications.

### **F. VALVE STEMS**

1. Check valve stems for damage or cracks.
  - a. **REJECT** when:
    - 1) Valve stem is cracked, damaged or shows evidence of wear because of misalignment.

### **G. RIMS, RINGS, NUTS, CLAMPS, STUDS, WHEELS**

1. Check rims.
  - a. **REJECT** when:
    - 1) Rims and rings are mismatched.
    - 2) Rings show evidence of slippage, rust, or damage.
    - 3) Rims or rings are bent, sprung, cracked or otherwise damaged.
    - 4) There is slippage on Louisville or Dayton type wheels.
    - 5) Wheel nuts have improper thread engagement.
    - 6) Wheel nuts, studs or clamps are loose, broken, damaged, missing or mismatched.
    - 7) Wheel rings, disc, spoke or rim type wheels show any evidence of having been repaired or re-welded.
    - 8) Stud holes are out-of-round or elongated.
    - 9) There are cracks between the hand holes or the stud holes in the disc.
    - 10) Wheel casting is cracked or there is evidence of wear in the clamping area.

## **TIRES AND WHEELS - (Continued)**

2. Check wheel welds.

a. **REJECT** when:

- 1) Any cracks in welds attaching disc wheel disc to rim.
- 2) Any crack in welds attaching tubeless demountable rim to adapter.
- 3) Any welded repair on any aluminum wheel(s).
- 4) Any welded repair other than disc to rim attachment on steel disc wheel(s) mounted on the steering axle.

## SECTION 3-STEERING ALIGNMENT AND SUSPENSION

The energy absorbing steering column may be used on light vehicles, but seldom if ever, on medium and heavy vehicles. If present, it should be inspected in the same manner as on a passenger car.

### **A. STEERING WHEEL LASH (Free Play)**

1. Check steering wheel for excessive play. STEERING WHEEL FREE PLAY SHALL NOT EXCEED THE FOLLOWING CRITERIA:

- a. **REJECT** when:

- 1) Steering wheel lash is beyond specifications shown on chart below.

Steering Wheel Diameter	Manual Steering	Power Steering
16"	2"	4 1/2"
18"	2 1/4 "	4 3/4"
20"	2 1/2"	5 1/4"
22"	2 3/4"	5 3/4"

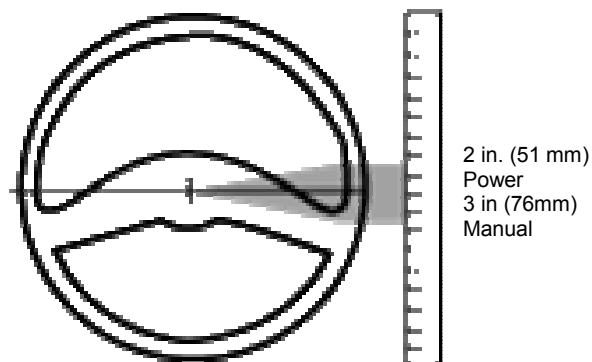


Figure T-2

Steering Lash

**Note: Excessive steering play may be determined as shown in this table. (Vehicles with power steering must be checked with engine running.)**

## **STEERING ALIGNMENT AND SUSPENSION – (Continued)**

### **B. STEERING COLUMN**

1. Check steering column for proper functioning. Check flexible coupling in steering column (if the vehicle is so equipped) for misalignment and tightness of adjusting screw or nut.
2. Check for absence or looseness of U-bolt(s) or positioning parts.
3. Check for worn, faulty or welded repairs of universal joint(s).
4. Check for loose or improperly secured steering wheel.
  - a. **REJECT** when:
    - 1) Flexible coupling is obviously misaligned.
    - 2) Clamp bolt (nut) is loose or missing.
    - 3) There is separation of the shear capsule from bracket and general “looseness” of wheel and column, or if wheel and column can be moved as a unit.
    - 4) Adjustable steering wheel or tilt steering cannot be secured in a safe operating position, or if there is 3/4 inch or more of movement at the center of the steering wheel when locked in the operating position.
    - 5) There is any absence or looseness of U-bolt(s) or positioning part(s).
    - 6) There are worn, faulty or welded repairs to universal joint(s).
    - 7) Steering wheel is not properly secured.
    - 8) Steering wheel has any cracks.

### **C. SIZE**

1. Check size of steering wheel.
  - a. **REJECT** when:
    - 1) Steering wheel is less than 13 inches in outside diameter or is not a full circular construction. (SAE Recommended Practice SAE J287)

## **STEERING ALIGNMENT AND SUSPENSION – (Continued)**

### **D. FRONT AXLE BEAM**

1. Check front axle beam for defects, cracks and welded repairs.
  - a. **REJECT** when:
    - 1) Kingpins are worn and show excessive movement.
    - 2) There are cracks.
    - 3) There are welds.
    - 4) There are bends.
    - 5) Positioning parts are loose. (U-bolts, spring hangers, etc.)

### **E. STEERING GEAR BOX**

1. Check steering gear box for proper functioning, including loose or missing mounting bolts and any cracks in gearbox or mounting brackets.
  - a. **REJECT** when:
    - 1) Any bolt is loose or missing at the frame or mounting brackets.
    - 2) There are cracks in the gear box or mounting brackets.
    - 3) Fasteners are missing.

### **F. PITMAN ARM**

1. Check pitman arm.
  - a. **REJECT** when:
    - 1) There is any looseness of the pitman arm on the steering gear output shaft.
    - 2) There are any welded repairs. (FMCSA 396.3(a)(1))



## **STEERING ALIGNMENT AND SUSPENSION – (Continued)**

### **G. POWER STEERING**

1. Check the auxiliary power assist cylinder for looseness.
2. Check power steering belts for proper condition and tension.
3. Inspect power steering system including gear, hoses, hose connections, cylinders, valves, pump and pump mounting for condition, rubbing and leaks.
4. Inspect power steering reservoir for fluid level below OEM specifications.
  - a. **REJECT** when:
    - 1) Auxiliary power assist cylinder is loose.
    - 2) Belts are frayed or cracked and tension is not maintained.
    - 3) Hoses or hose connections have been rubbed by moving parts or are leaking.
    - 4) Cylinders, valves or pump show evidence of leakage.
    - 5) Pump mounting parts are loose or broken.
    - 6) Power steering system is inoperative.
    - 7) Power steering fluid level is below OEM specifications.

### **H. BALL AND SOCKET JOINTS**

1. Check for any movement under the steering load of a stud nut.
2. Check for any motion, other than rotational, between any linkage member and its attachment point of more than 1/8 inch.
  - a. **REJECT** when:
    - 1) There is any movement under steering load of a stud nut.
    - 2) There is any motion, other than rotational, between any linkage member and its attachment point of more than 1/8 inch.

## **STEERING ALIGNMENT AND SUSPENSION – (Continued)**

### **I. TIE RODS AND DRAG LINKS**

1. Check tie rods and drag links for loose clamp(s) or clamp bolt(s).
2. Check for loose or missing nuts on tie rods, pitman arm, drag link, steering arm or tie rod arm.

**a. ADVISE when:**

- 1) Tie rod grease seals are cut, torn or otherwise damaged to the extent that lubricant will not be retained.

**b. REJECT when:**

- 1) There are loose or missing clamps or bolt(s).
- 2) There are worn tie rod ends.
- 3) There are loose or missing nuts on tie rods, pitman arm, drag link, steering arm or tie rod arm.
- 4) Any looseness is detected in any threaded joint.

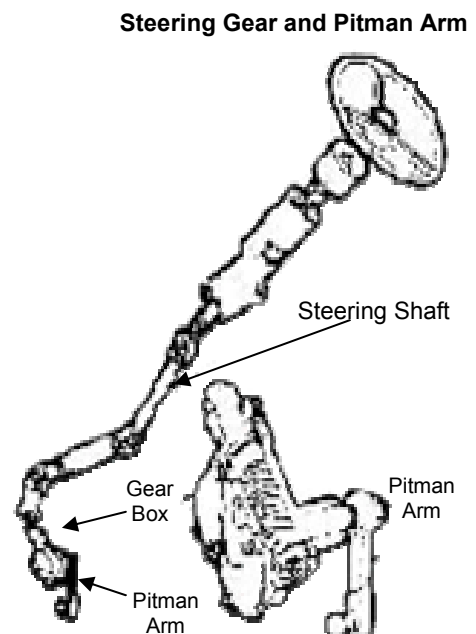
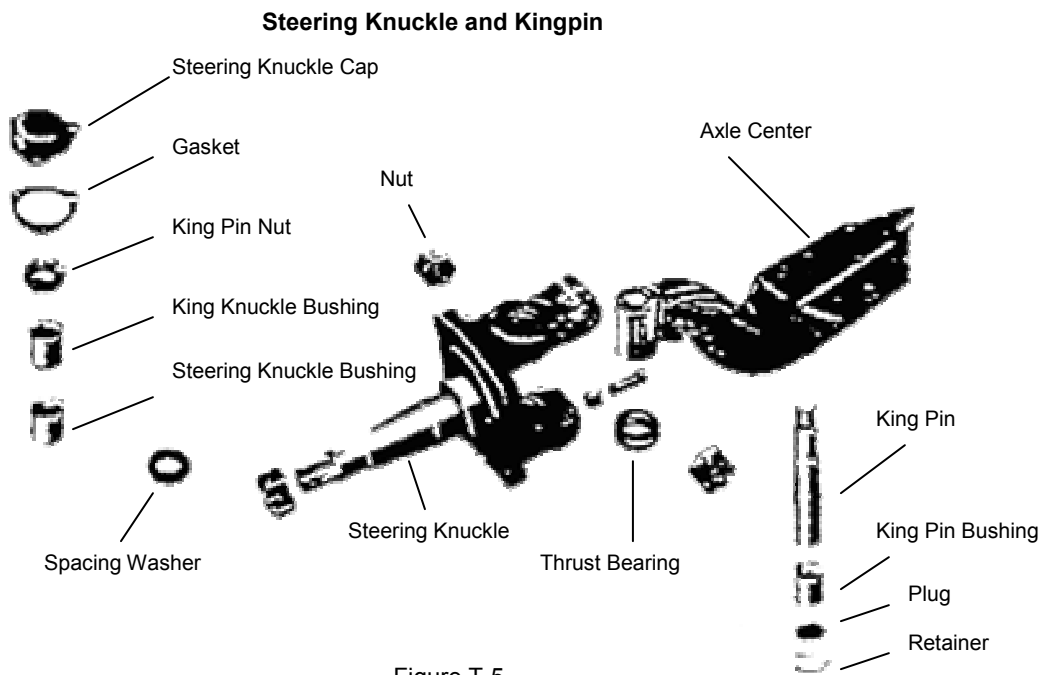


Figure T-4

## **STEERING ALIGNMENT AND SUSPENSION – (Continued)**



## **STEERING ALIGNMENT AND SUSPENSION – (Continued)**

### **J. STEERING SYSTEM**

1. Check for any modifications or other condition that may interfere with free movement of any steering component.
  - a. **REJECT** when:
    - 1) Any modification or other condition interferes with free movement of any steering component.

### **K. STEERING LINKAGE, KINGPIN, SPRINGS**

1. LINKAGE PLAY – Too much free play causes wheel shimmy, erratic brake action and steering control problems. Make sure that any looseness detected is not wheel bearing free play by applying service brakes during the inspection.

**Trucks with “I” beam, twin “I” beam, or tube type front axle – Hoist truck under axle, grasp front and rear of tire and attempt to shake assembly right and left to determine linkage-looseness. Then grasp top and bottom of tire and attempt to rock in and out to determine kingpin looseness. Record movement at front and rear edge – top and bottom edge of tire. A bar for leverage may be used for heavy wheels. If the inspector uses the “leverage” of a pry bar to exert pressure, he can easily “force” an apparent ball joint movement and get a false reading.**

## **STEERING ALIGNMENT AND SUSPENSION – (Continued)**

### **L. LEAF SPRING SUSPENSIONS**

1. Check for cracked, broken, loose, missing or sagging suspension springs. Inspect spring shackles, spring center bolts, U-bolts, clips and other attaching parts.
2. Check for any U-bolts, spring hangers, or other axle positioning parts that are cracked, broken, loose or missing.
  - a. **REJECT** when:
    - 1) Springs are cracked, broken, loose, missing, separated or sagging.
    - 2) Spring attaching parts are cracked, broken, loosely connected, missing, worn, or sagging.
    - 3) Improper spring size and rating are utilized which do not meet or exceed OEM specifications.
    - 4) U-bolts, spring hangers, or other axle positioning parts are cracked, broken, loose or missing.

***NOTE: After a turn, lateral axle displacement is normal with some suspensions. Forward or rearward operation in a straight line should cause the axle to return to alignment.***

### **M. ALL OTHER SUSPENSION**

1. Check shock absorbers.
2. Check for broken coil springs.
3. Check for broken torsion bar spring in a torsion bar suspension.
4. Check for deflated air suspension, i.e., system failure, leaks.

## **STEERING ALIGNMENT AND SUSPENSION – (Continued)**

a. **REJECT** when:

- 1) Rubber bushings are destroyed or missing.
- 2) Mountings are loose, broken or missing.
- 3) Shock absorbers are missing or disconnected.
- 4) Shock absorbers are leaking.
- 5) Coil springs are broken or missing.
- 6) Torsion bar spring is broken.
- 7) Air suspension is deflated, indicating a system failure.
- 8) Any component that is the improper size or rating or that is leaking, cracked, misaligned or broken.

### **N. TORQUE, RADIUS OR TRACKING COMPONENTS**

1. Check all torque, radius and tracking components for proper operation.

a. **REJECT** when:

- 1) Any part of a torque, radius or tracking component assembly or any part used for attaching the same to the vehicle frame or axle is cracked, loose, broken or missing.

**Note: This does not apply to loose bushings in torque or track rods.**

### **O. WHEEL TRACKING**

1. Check wheel tracking using the following:

With the front wheels in a straight-ahead position, measure the distance between the center of the front wheels to the center of the rear wheels. Compare the dimensions on the right side against the dimensions on the left.

a. **REJECT** when:

- 1) The dimensions between wheel centers on one side differ from the dimensions on the other side by more than one (1) inch.

## **SECTION 4- COUPLING DEVICES**

### **A. FIFTH WHEEL**

1. Check the mounting to frame.
  - a. **REJECT** when:
    - 1) Any fasteners are missing or ineffective.
    - 2) Any movement between mounting components is detected.
    - 3) Any mounting angle iron is cracked or broken.
2. Check mounting plates and pivot brackets.
  - a. **REJECT** when:
    - 1) Any fasteners are missing or ineffective.
    - 2) Any cracks in welds or parent metal are detected.
    - 3) More than 3/8 inch horizontal movement between pivot bracket pin and bracket exists.
    - 4) **Pivot bracket pin missing or not secured.**
3. Check sliders.
  - a. **REJECT** when:
    - 1) Any latching fasteners are missing or ineffective.
    - 2) Any fore or aft stops are missing or are not securely attached.
    - 3) Movement more than 3/8 inch between slider bracket and slider base exists.
    - 4) Any slider component is cracked in parent metal or weld.

## **COUPLING DEVICES - Continued**

### 4. Lower coupler.

#### a. **REJECT** when:

- 1) Horizontal movement between the upper and lower fifth wheel halves exceeds 1/2 inch.
- 2) Operating handle not in closed or locked position.
- 3) Kingpin not properly engaged.
- 4) Separation between upper and lower coupler allows light to show through from side to side.
- 5) Cracks are detected in the fifth wheel plate: Exceptions – Cracks in the fifth wheel approach ramps and casting shrinkage cracks in the ribs of the body of a cast fifth wheel are allowed.
- 6) Locking mechanism parts are missing, broken or deformed to the extent the kingpin is not securely held.

## **B. PINTLE HOOKS**

### 1. Mounting to frame.

#### a. **REJECT** when:

- 1) There are any missing or ineffective fasteners (a fastener is not considered missing if there is an empty hole in the device but no corresponding hole in the frame or vice versa).
- 2) Mounting surface cracks extend from point of attachment (e.g., cracks in the frame at mounting bolt holes.)
- 3) Pintle hook is loosely mounted.
- 4) Frame cross member providing pintle hook attachment is cracked.
- 5) Cracks are discovered anywhere in pintle hook assembly.
- 6) Any welded repairs have been made to the pintle hook.
- 7) Any part of the horn section has been reduced by more than 20%.



## **COUPLING DEVICES – (Continued)**

### **C. DRAWBAR / TOW-BAR EYE**

1. Check the drawbar / tow-bar eye for proper mounting.
  - a. **REJECT** when:
    - 1) Any cracks in attachment welds are discovered.
    - 2) Any missing or ineffective fasteners are discovered.
    - 3) Any cracks are discovered.
    - 4) Any part of the eye is reduced by more than 20%.

### **D. DRAWBAR / TOW-BAR TONGUE**

1. Slider (power or manual). Check drawbar / tow-bar tongue for proper operation.
  - a. **REJECT** when:
    - 1) Latching mechanism is ineffective or disconnected.
    - 2) Stops are missing or ineffective.
    - 3) There is movement of more than 1/4 inch between slider and housing.
    - 4) Leaks are discovered including; air, hydraulic cylinders, hoses, or chambers (other than normal oil weeping around hydraulic seals).
2. Integrity: Check for cracks and movement of 1/4 inch between slider and housing.
  - a. **REJECT** when:
    - 1) Any cracks are discovered.
    - 2) There is movement of 1/4 inch or more between sub-frame and drawbar at point of attachment.

### **E. SAFETY DEVICES**

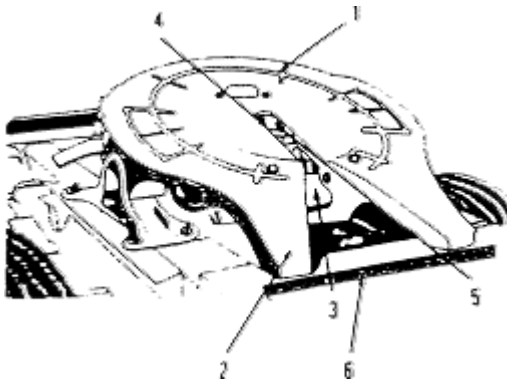
1. Check for missing safety devices, chains, metal wire rope, etc.
2. Check for safety devices that are unattached or incapable of secure attachment.
3. Check for worn chains and hooks.

## **COUPLING DEVICES – (Continued)**

4. Check for kinked or broken cable strands and improper clamps or clamping.
  - a. **REJECT** when:
    - 1) Safety devices are missing.
    - 2) Safety devices are unattached.
    - 3) Safety devices are incapable of secure attachment.
    - 4) Chains and hooks are worn to the extent of a measurable reduction in link cross section.
    - 5) Improper repairs are evident including welding, wire, small bolts, rope and tape.
    - 6) Cable has kinked or broken cable strands.
    - 7) Cable has improper clamps or clamping.

### **F. FIFTH WHEEL DIAGRAMS**

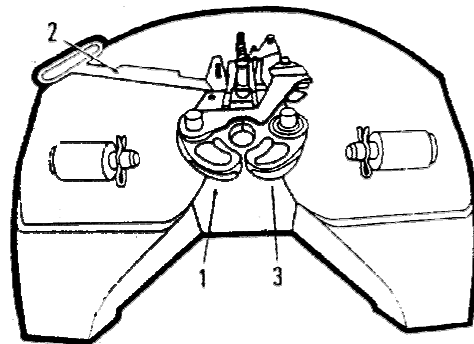
**Fifth Wheel Parts**



1. Skid Plate
2. Skid Ramp
3. Throat
4. Coupler Jaws
5. Locking Mechanism
6. Skid Ramp Stop

Figure T-6

**Fifth Wheel Components**



1. Coupler Arm
2. Release Handle
3. Locking Jaws

Figure T-7

## **COUPLING DEVICES – (Continued)**

### **G. PINTLE HOOKS DIAGRAM**

#### **Types of Pintle Hooks**

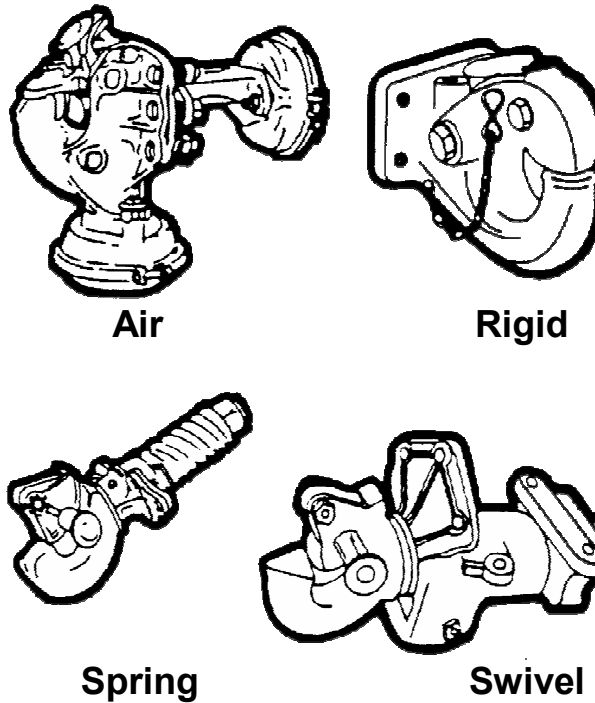


Figure T-8

### **H. DRAWBAR DIAGRAMS**

#### **Drawbars**

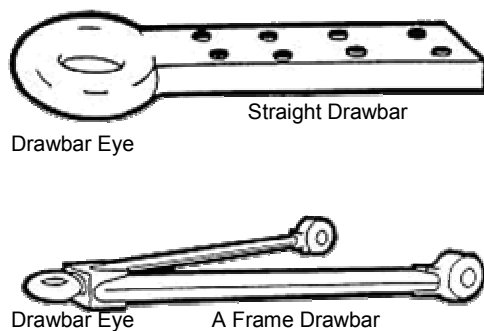


Figure T-9

## **COUPLING DEVICES – (Continued)**

### **I. UPPER FIFTH WHEEL PLATE AND KINGPIN DIAGRAM**

#### **Upper Fifth Wheel Plate and Kingpin**

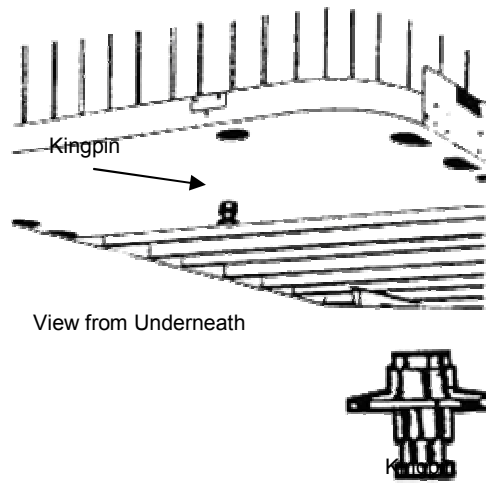


Figure T-10

### **J. CONVERTER DOLLY DIAGRAM**

#### **Converter Dolly**

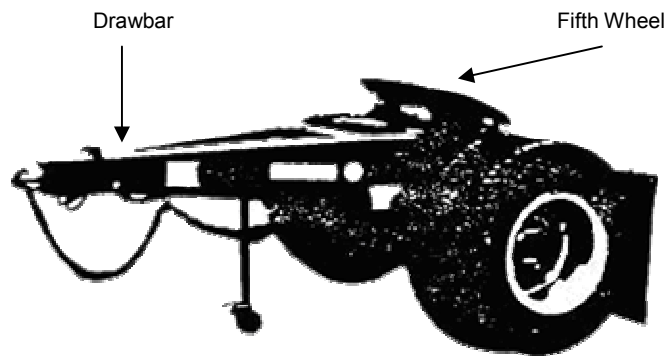


Figure T-11

## **SECTION 5 – BRAKES**

Only qualified personnel with proper equipment should inspect brakes on all trucks and buses. **All brakes must be inspected.** When repairs are warranted, replacement parts must meet or exceed OEM specifications.

***\*NOTE: Heavy-duty trucks and buses are not required to have wheels pulled if the vehicle is equipped with inspection ports/slots, (adjustment slots are not inspection plates) or if the vehicle has open brake drums or if the vehicle is tested by a plate brake tester. Any truck or truck tractor manufactured after July 24, 1980, must have brakes on the front wheels.***

Any full trailer, semi-trailer, or any pole trailer having a gross vehicle weight rating (GVWR) of 3,000 pounds or more, must have brakes operating on all wheels. This requirement is found in the Federal Motor Carrier Safety Regulations (FMCSR) Part 393.42.

Breakaway brakes shall be required on trailers with a gross weight of 3,000 pounds or more.

**Brake Adjustment** refer to Brake Diagrams/Charts.

When measuring the amount of brake push rod travel allowed, it is important to reference the accompanying charts located in this Safety Inspection Manual. The type and size of a brake chamber determines the allowable push rod specification. Larger brake chambers will result in more allowable push rod travel.

Often, the type of brake chamber is marked on the chamber itself, usually on the band (clamp) around its circumference. If no marking is discovered, you must measure the diameter of the chamber (at the band “clamp”) itself. The resulting measurement, when referenced in the contained chart, will indicate the brake can type and the maximum push rod stroke.

**Inspectors certified in heavy truck and bus inspections must inspect all vehicles manufactured or equipped with air brakes, regardless of weight.**

## **BRAKES - (Continued)**

### **A. CHECK BRAKE SYSTEM ON ALL VEHICLES**

1. Check the service brakes for proper operation and for missing brakes when required. Check for broken, missing or loose components, brake lining air leaks in brake chambers, brake readjustment limits, mismatch across steering axle of air chamber sizes and slack adjuster length.

**\*NOTE: For Wedge Brakes – Movement on the scribe mark on the lining shall not exceed 1/16 inch.**

**a. REJECT when:**

- 1) There is absence of any braking action, on any axle required to have brakes, upon application of the service brakes (such as missing brakes or brake shoe(s), failing to move upon application of a wedge, S-cam, cam or disc brake).
- 2) There are missing or broken mechanical components including: shoes, linings, pads, springs, anchor pins, spiders, cam rollers, push-rods and air chamber mounting bolts.
- 3) Brake linings are contaminated with oil, grease, or brake fluid.

**\*NOTE: Once a brake lining or pad has been contaminated, replacement is required.**

- 4) Brake linings are broken, cracked or pads are not firmly attached to the shoe.
- 5) There are loose brake components including air chambers, spiders, and cam shaft support brackets.
- 6) There are audible air leaks at brake chamber. Example – ruptured diaphragm, loose chamber clamp, etc.
- 7) Brakes are beyond adjustment limits (see charts). Stroke shall be measured with engine off and reservoir pressure of 90 to 100 PSI with brakes fully applied. **Brake chambers utilizing long stroke push rods are allowed a greater maximum stroke at which brakes should be readjusted. (See attached charts for exact readjustment limits).**

## **BRAKES - (Continued)**

- 8) Both steering and non-steering axles: Brake lining has a thickness less than 1/4 inch at the shoe center for air drum brakes, 1/16 inch or less at the shoe center for hydraulic and electric drum brakes, and less than 1/8 inch for air disc brakes.
- 9) Mismatch across any power unit steering axle of:
  - (a) Air chamber sizes
  - (b) Slack adjuster length

### **B. PARKING BRAKE SYSTEM**

- 1. Check parking brake system.
  - a. **REJECT** when:
    - 1) No brakes on the vehicle or combination are applied upon actuation of the parking brake control, including driveline hand controlled parking brakes.

### **C. BRAKE DRUM AND ROTORS**

- 1. Check brake drums for damage, wear and contamination
- 2. Check brake rotors for damage, wear and contamination.
  - a. **REJECT** when:
    - 1) Brake drum has any crack that opens upon brake application. (Do not confuse short hairline heat cracks with flexural cracks).
    - 2) Any portion of the brake drum or rotor is missing or in danger of falling away.
    - 3) There are fluids contaminating the friction surface of either brake drum or rotor.
    - 4) The inside diameter of drum measures more than discard diameter stamped on the drum. For unmarked drums refer to OEM specifications.
    - 5) Thickness of disc is less than the minimum thickness stamped on the disc.

## **SECTION 5-BRAKES - (Continued)**

### **D. BRAKE HOSES**

1. Check brake hoses for any damage, for bulges or swelling, audible leaks and proper fittings.
  - a. **REJECT** when:
    - 1) Brake hoses have any damage extending through outer reinforcement ply. (Rubber impregnated fabric cover is not reinforcement ply. Thermoplastic nylon may have braid reinforcement or color difference between cover and inner tube.) Exposure of second color is cause for rejection.
    - 2) Bulges or swelling is evident when air pressure is applied.
    - 3) Any audible air leaks are present.
    - 4) Two brake hoses are improperly joined (such as a splice made by sliding the hose ends over a piece of tubing and clamping the hose to the tube.) A correct new pressure fitting is allowed.
    - 5) Air hoses are cracked, broken or crimped.

### **E. BRAKE TUBING**

1. Check brake tubing for any damage, leaks and general condition.
  - a. **REJECT** when:
    - 1) Any audible air leaks are present.
    - 2) Brake tubing is cracked, damaged by heat, broken or crimped.



## **BRAKES - (Continued)**

### **F. LOW PRESSURE WARNING DEVICE**

1. Check Low Pressure Warning Device
  - a. **REJECT** when:
    - 1) Device is missing, inoperative, or does not operate at 55 PSI and below. (Vehicles manufactured after March 1, 1975 must have a visual warning device.)

### **G. TRACTOR PROTECTION VALVE (DEVICE)**

1. Check tractor protection valve (device) on power unit.
  - a. **REJECT** when:
    - 1) The tractor protection valve is inoperative or missing.

### **H. AIR BRAKES / COMPRESSOR**

1. Check for proper operation and condition.
  - a. **REJECT** when:
    - 1) Compressor drive belts are in a condition of impending or probable failure.
    - 2) Compressor mounting bolts are loose.
    - 3) Pulley is cracked, broken, or loose.
    - 4) Mounting brackets, braces, and adapters are loose, broken or missing.

### **I. ELECTRIC BRAKES AND BREAKAWAY BRAKING DEVICE**

1. Check electric brakes and breakaway braking device.
  - a. **REJECT** when:
    - 1) There is absence of braking action on any wheel required to have brakes.
    - 2) Breakaway braking device is missing or inoperable.

## **BRAKES - (Continued)**

### **J. HYDRAULIC BRAKES. (Including power assist over hydraulic, engine drive hydraulic booster & dual hydraulic circuits)**

1. Check hydraulic brakes, including power assists & dual hydraulic circuits for proper operation.

a. **REJECT** when:

- 1) Master cylinder is below add line or less than 3/4 full.
- 2) There is no pedal reserve when engine is running except by pumping pedal.
- 3) Power assist unit fails to operate.
- 4) Brake hoses are seeping or swelling under application of pressure.
- 5) Check valve is missing or inoperative.
- 6) Hydraulic fluid is observed leaking from the brake system.
- 7) Hydraulic hoses are abraded (chafed) through outer cover-to fabric layer.
- 8) Fluid lines (hoses or tubes) or connections are leaking, restricted, crimped, cracked or broken.
- 9) Brake failure or low fluid warning light is on and/or inoperative.

## **BRAKES - (Continued)**

### **K. VACUUM BRAKING SYSTEMS**

1. Check Vacuum Braking System for proper operation.
  - a. **REJECT** when:
    - 1) There is insufficient vacuum reserve to permit one full brake application after engine is shut off.
    - 2) Vacuum hoses or lines are leaking, restricted, abraded (chafed) through outer cover to cord ply, crimped, cracked, broken or has collapse of vacuum hoses when vacuum is applied.
    - 3) Low-vacuum warning device is missing or inoperative.

### **L. WHEEL SEALS**

1. Check for leaking wheel seals.
  - a. **REJECT** when:
    - 1) Wheel seals are leaking.

### **BRAKE CHAMBER SIZE CHARTS**

### **M. BOLT TYPE (Dimension in Inches)**

Type	Effective Area (Square Inches)	Outside Diameter	Maximum stroke at which brakes should be readjusted
A	12	6 15/16	1 3/8
B	24	9 3/16	1 3/4
C	16	8 1/6	1 3/4
D	6	5 1/4	1 1/4
E	9	6 3/16	1 3/8
F	36	11	2 1/4
G	30	9 7/8	2

Figure T-12

## **BRAKES - (Continued)**

### **BRAKE CHAMBER SIZE CHARTS (Continued)**

#### **N. ROTOCHAMBER TYPE- (Diameter in Inches)**

Type	Effective Area (Square Inches)	Outside Diameter	Maximum stroke at which Brakes should be readjusted
9	9	4 9/32	1 1/2
12	12	4 13/16	1 1/2
16	16	5 13/32	2
20	20	5 15/16	2
24	24	6 13/32	2
30	30	7 1/16	2 1/4
36	36	7 5/8	2 3/4
50	50	8 7/8	3
Figure T-13			

#### **O. CLAMP TYPE-(Diameter in Inches)**

Type	Effective Area (Square Inches)	Outside Diameter	Maximum stroke at which brakes should be readjusted
6	6	4 1/2	1 1/4
9	9	5 1/4	1 3/8
12	12	5 11/16	1 3/8
16	16	6 3/8	1 3/4
20	20	6 25/32	1 3/4
24	24	7 7/32	1 3/4
30	30	8 3/32	2
36	36	9	2 1/4
Figure T-14			

## **BRAKES - (Continued)**

### **BRAKE CHAMBER SIZE CHARTS (Continued)**

#### **P. LONG STROKE CLAMP TYPE BRAKE**

**CHAMBER DATA (Diameter in Inches)**

Type	Outside Diameter		Brake Adjustment Limit	
12	5-11 / 16	( 14.5 mm )	1 - 3 / 4	( 4.5 cm )
16	6 3 / 8	( 162 mm )	2.0	( 51 mm )
20	6 – 25 / 32	( 72 mm )	2.0	( 51 mm )
24	7 – 7 / 32	( 184 mm )	2.0	( 51 mm )
24*	7 – 7 / 32	( 184 mm )	2.5	( 64 mm )
30	8 – 3 / 32	( 206 mm )	2.5	( 64 mm )

Figure T-15

#### **Q. STEERING AXLES**

VEHICLE FAILS IF BRAKE LININGS FOR:	
DRUM BRAKES (ALL DRUM BRAKES)	ARE LESS THAN 1/4 INCH
AIR DISC BRAKES	ARE LESS THAN 1/8 INCH
HYDRAULIC DISC	ARE AT 1/16 INCH OR LESS
ELECTRIC BRAKES	ARE AT 1/16 INCH OR LESS

Figure T-16

#### **R. NON STEERING AXLES**

VEHICLE FAILS IF:	
AIR DRUM BRAKES	ARE LESS THAN 1/4 INCH
AIR DISC BRAKES	ARE LESS THAN 1/8 INCH
HYDRAULIC DRUM	ARE AT 1/16 INCH OR LESS
ELECTRIC DRUM	ARE AT 1/16 INCH OR LESS

Figure T-17

## **BRAKES - (Continued)**

The brake chamber converts the energy of air pressure into mechanical force and motion, which activates the braking mechanism. The slack adjuster is the link between the brake chamber and the brake camshaft. It transforms and multiplies the forces developed by the brake chamber into a torque which applies the brakes via the brake camshaft. Slack adjusters are equipped with an adjusting mechanism. Automatic slack adjusters perform the same function as the standard unit, except that it automatically adjusts for lining wear. All braking components must be maintained in good working order and properly adjusted in order to achieve optimal braking ability.

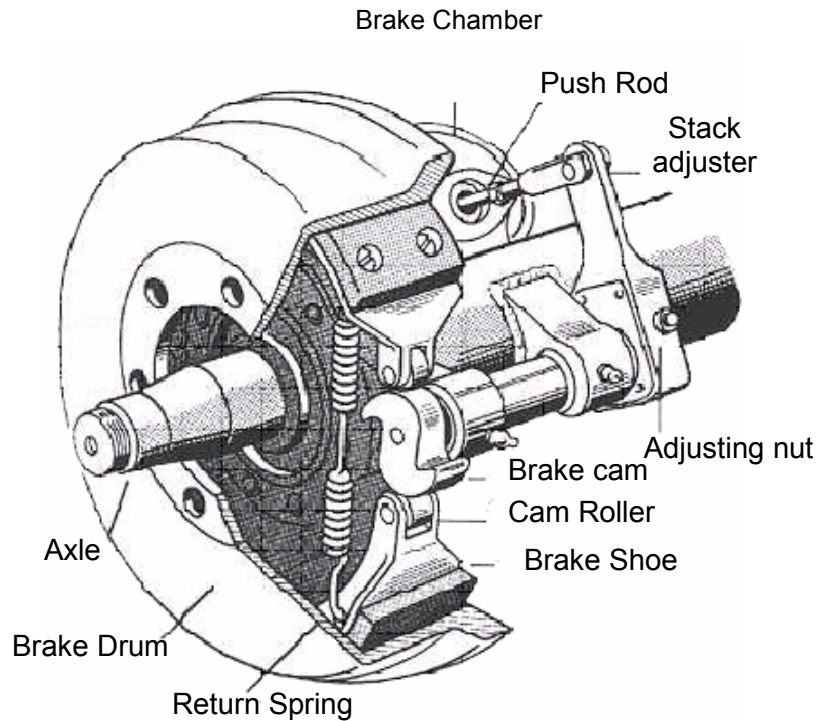


Figure T-18

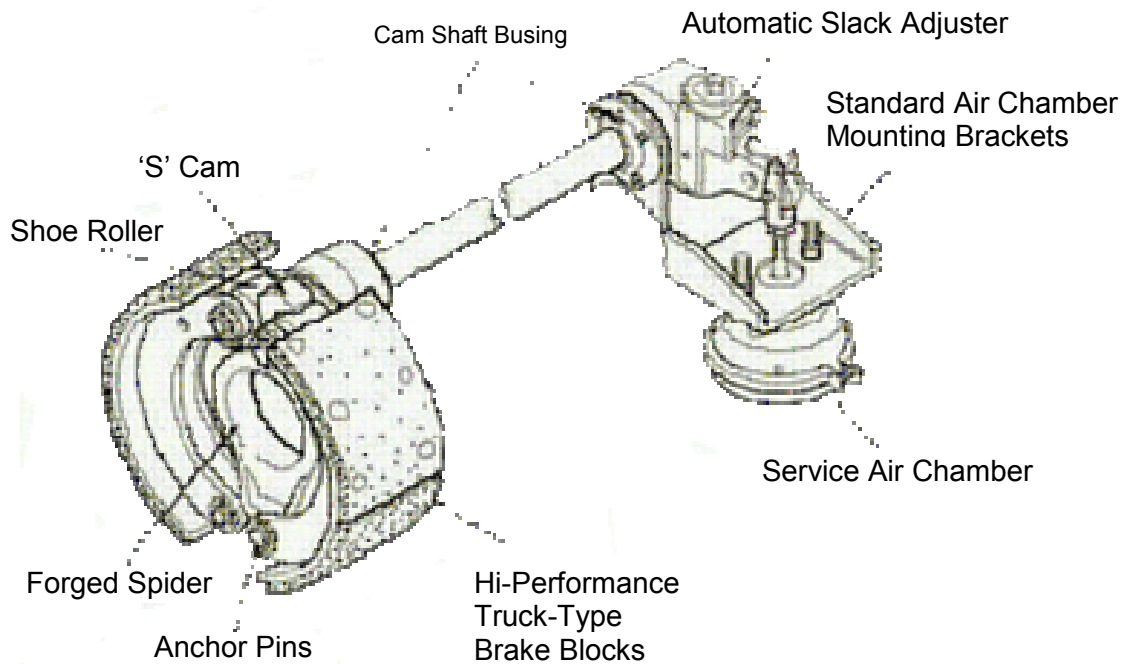


Figure T-19

## **BRAKES - (Continued)**

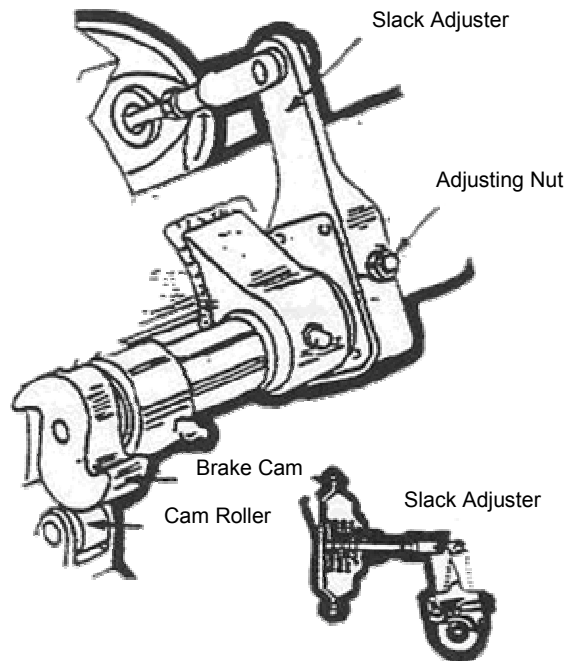


Figure T-20

THE SLACK ADJUSTER IS THE LINK BETWEEN THE ACUATOR (BRAKE CHAMBER) AND THE FOUNDATION BRAKE CAMSHAFT. IT TRANSFORMS AND MULTIPLIES THE FORCES DEVELOPED BY THE BRAKE CHAMBER INTO A TORQUE WHICH APPLIES THE BRAKES VIA THE BRAKE CAMSHAFT. SLACK ADJUSTERS ARE EQUIPPED WITH AN ADJUSTING MECHANISM, PROVIDING A MEANS OF ADJUSTMENT TO WHERE THE ANGLE IS LESS THAN 90 DEGREES, THE BRAKE FORCE DIMINISHES AND THE PUSH ROD MAY BOTTOM OUT.

## **BRAKES - (Continued)**

### **Limiting & Quick Release Valve**

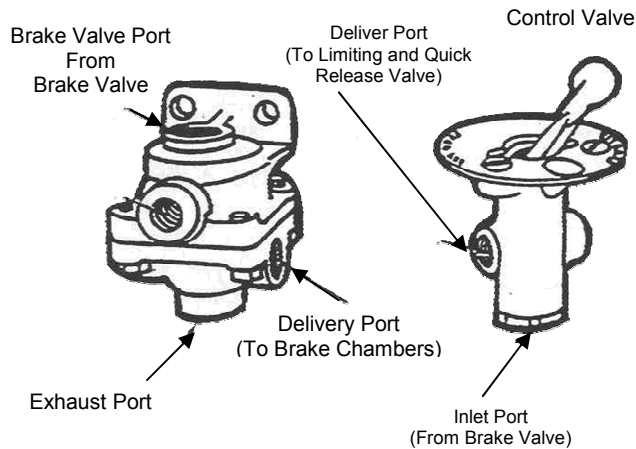


Figure T-21

THE FRONT BRAKE LIMITING AND QUICK RELEASE VALVE, MOUNTED ON THE FRONT AXLE SERVES TWO FUNCTIONS. THE VALVE LIMITS FRONT AXLE SERVICE BRAKE APPLICATION BY 50% AND SERVES AS A QUICK RELEASE VALVE FOR THAT AXLE. IT IS ACTUATED BY A CONTROL VALVE ON THE VEHICLE DASH, WHICH ALLOWS IT TO BE PLACED IN THE 50% LIMITING (SLIPPERY ROAD) POSITION OR IN THE NORMAL, (DRY ROAD) POSITION. IN THE NORMAL POSITION, IT WILL DELIVER FULL APPLICATION PRESSURE.

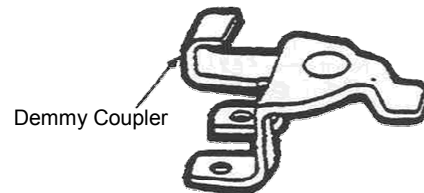
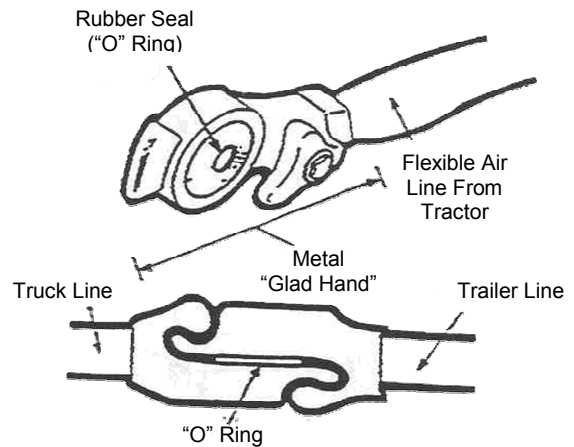


Figure T-22

COUPLINGS USED ON SERVICE AND EMERGENCY LINES BETWEEN TRACTORS AND TRAILERS ARE DESIGNED SO THAT WHEN TWO ARE CONNECTED TOGETHER, RUBBER GASKETS ARE PRESSED FIRMLY TOGETHER TO MAKE AN AIRTIGHT SEAL.

### **Service and Emergency Airlines**

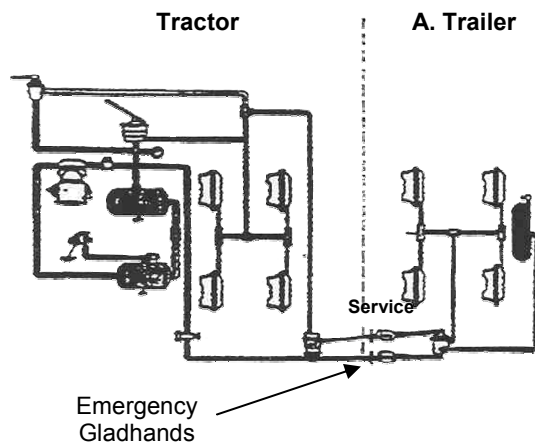


Figure T-23

### **Trailer Breakaway**

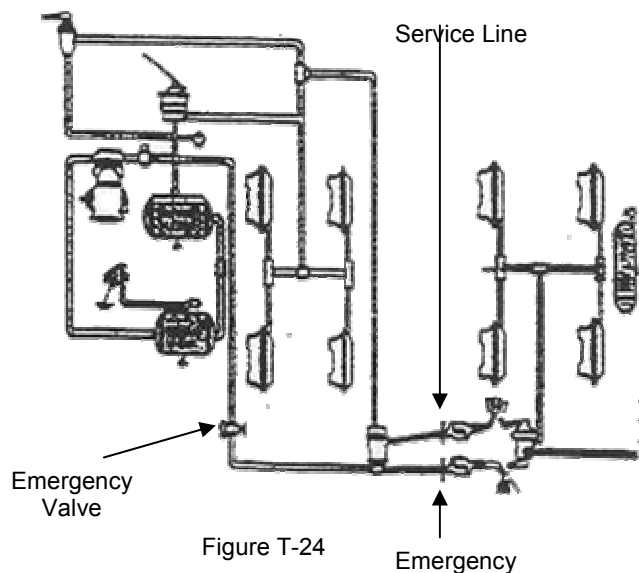


Figure T-24



## **BRAKES - (Continued)**

**Air Reservoir Pressure Gauge**

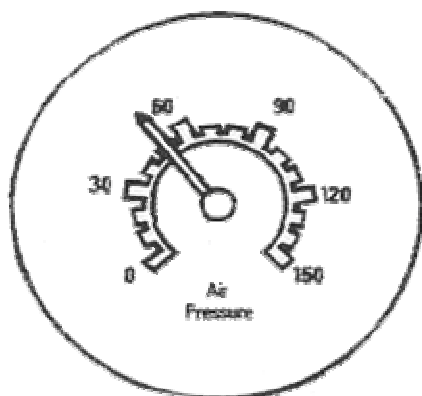


Figure T-25

THE AIR RESERVOIR PRESSURE GAUGE INDICATES THE AVAILABLE AIR PRESSURE IN BOTH THE TRACTOR AND TRAILER RESERVOIRS. ON A DUAL CIRCUIT SYSTEM THE GAUGE CONTAINS TWO POINTERS NORMALLY OF CONTRASTING COLORS. ONE POINTER REGISTERS AIR PRESSURE IN ONE SYSTEM, AND THE OTHER POINTER REGISTERS PRESSURE IN THE OTHER SYSTEM. SOME DUAL SYSTEM VEHICLES ARE EQUIPPED WITH TWO SEPARATE GAUGES.

**Low Air Pressure Warning Devices**

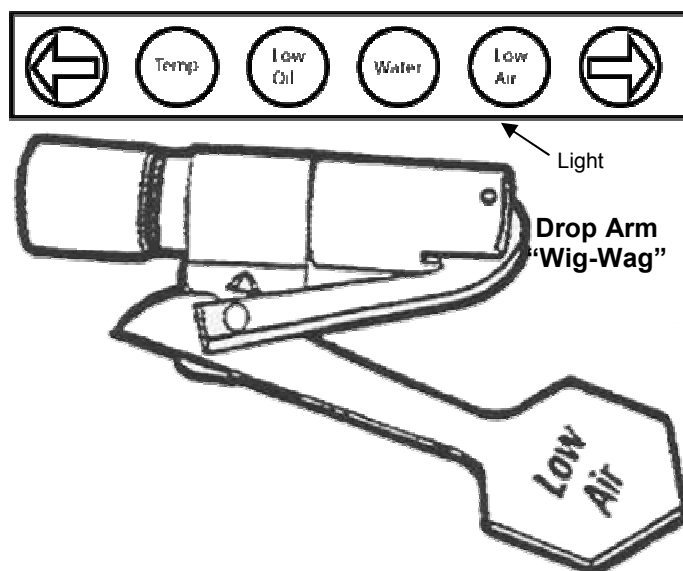


Figure T-26

LOW AIR PRESSURE WARNING DEVICES ARE PRESSURE OPERATED ELECTRO-PNEUMATIC SWITCHES THAT ARE DESIGNED TO PROVIDE WARNING TO THE DRIVER IN THE EVENT AIR PRESSURE IN THE SERVICE BRAKE SYSTEM IS BELOW A SAFE MINIMUM FOR NORMAL OPERATION. THE DEVICE, AVAILABLE IN VARIOUS PRESSURE SETTINGS, IS NOT ADJUSTABLE, AND IS USED IN CONJUNCTION WITH A DASH-MOUNTED LAMP OR WARNING BUZZER OR BOTH, OR IN OLDER VEHICLES A DROP ARM "WIG-WAY"

## **BRAKES - (Continued)**

**With Brakes Applied and Pressure Between 80-90 PSI**

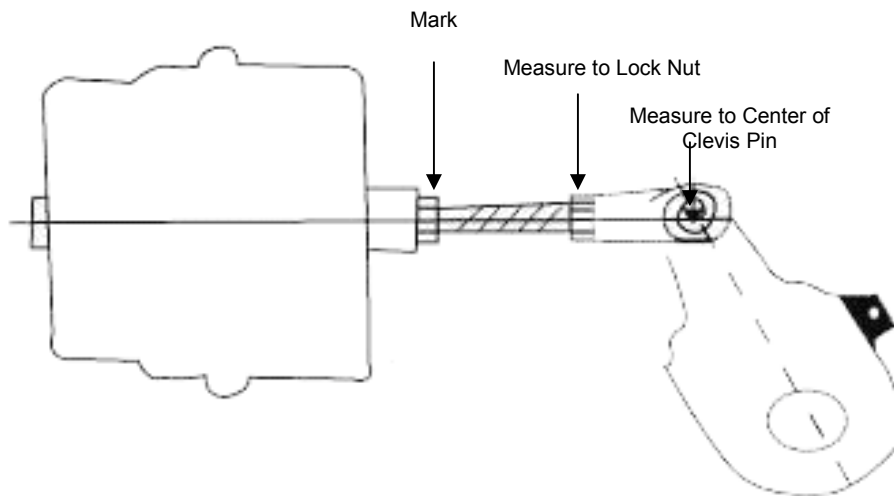


Figure T-27

**Measure Stroke with Pressure Applied  
Air Pressure Should Be Between 80-90 PSI**

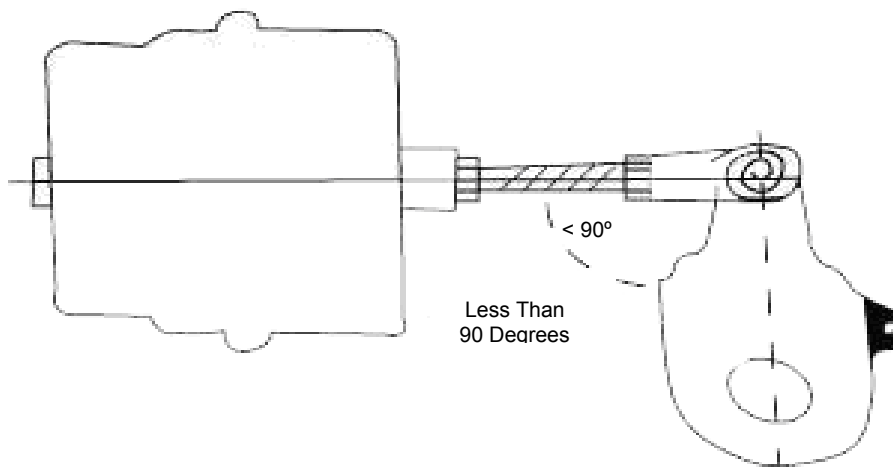


Figure T-28

## **BRAKES - (Continued)**

### **Spring Brake Chamber**

Standardized Trapezoidal shaped ID Tag secured to service chamber clamp band bolts.

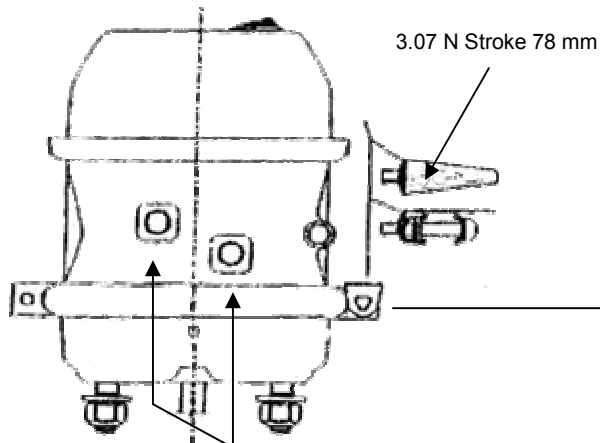


Figure T-29

Square parts are cast right into flange case to ensure tamper proof identification that is pronounced and easily detectable.

Servicing Instructions are embossed into the Flange Case for when diaphragm replacement is required.

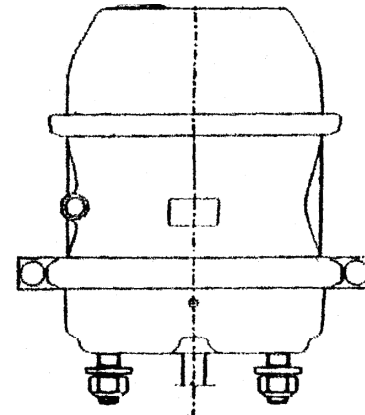


Figure T-30

Servicing instructions are stamped into the pressure cap for when diaphragm replacement is required.

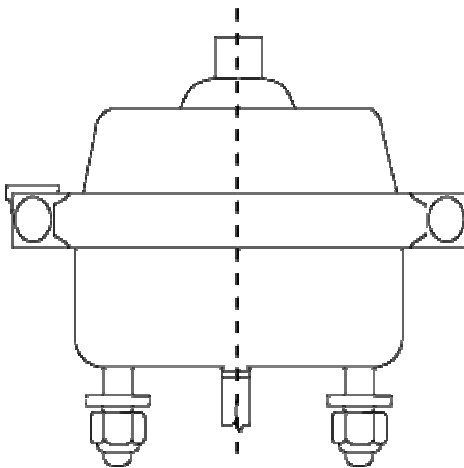


Figure T-31

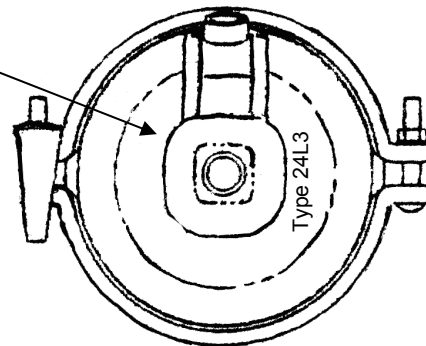


Figure T-32

Square embossment is raised a full half inch from the top of the pressure cap to ensure tamper – proof identification that is pronounced and easily detectable.

## **SECTION 6-ELECTRICAL SYSTEMS**

### **A. HORN**

1. Check the horn to make sure that it is securely fastened and works properly.
  - a. **REJECT** when:
    - 1) Horn is not securely fastened.
    - 2) Horn does not function properly (must be audible under normal conditions at a distance of not less than 200 feet).

### **B. ELECTRICAL**

1. All switches should function properly.
  - a. **ADVISE** when:
    - 1) **ANY** original equipment switch fails to function as designed.

### **C. ELECTRICAL WIRING**

1. Check all wiring to make sure it is not chafed, bare or contacting sharp objects.
  - a. **REJECT** when:
    - 1) Wiring insulation is chafed, rubbed bare, or shows any evidence of burning or short-circuiting.

### **D. ELECTRICAL CONNECTIONS**

1. All connectors should be tight and secure.
  - a. **ADVISE** when:
    - 1) Connections are not tight and secure or connections are corroded.

## **ELECTRICAL SYSTEMS - Continued**

### **E. AUTOMATIC TRANSMISSIONS STARTING SWITCH**

1. Check neutral starting system to determine that starter operates only with gear selector in "P" or "N". Set parking brake, place wheel blocks. With foot brake applied, turn on ignition switch.
  - a. **REJECT** when:
    - 1) Starter operates with gear selector in any gear other than "P" or "N".

### **F. BATTERY SECUREMENT**

1. Check for battery securement.
  - a. **REJECT** when:
    - 1) Battery is not properly secured. (FMCSA 393.30)

**NOTE: Battery shall not be secured by a temporary repair ie: bungee cord.**

## SECTION 7 – LIGHTING SYSTEM

### **A. ALL ORIGINAL EQUIPMENT LIGHTS MUST BE OPERATIONAL.**

1. Check all lights for secure mounting, proper location, and correct color.

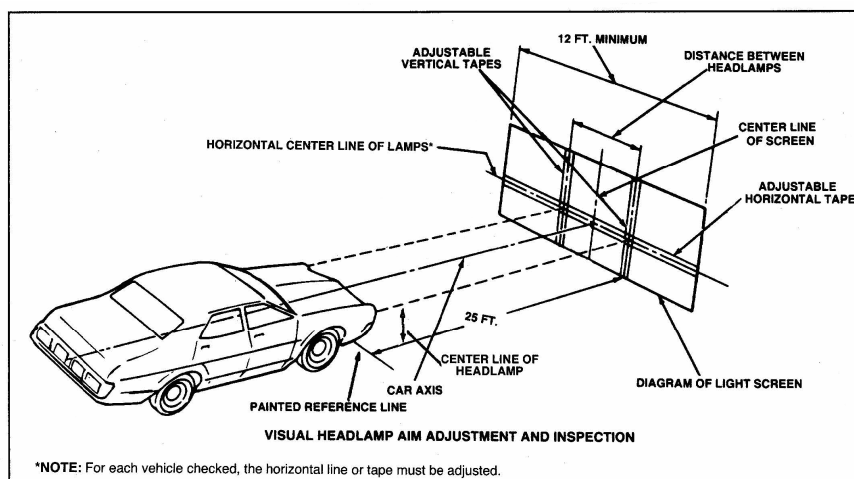
a. **REJECT** when:

- 1) Lights are missing, not secured, or emitting light of improper color.
- 2) Lights are in wrong position, not operating and in the case of headlights and auxiliary lights, if not properly aimed (not more than 4" horizontal or 4" vertical aim off center) and for proper intensity.

### **3) The following requirements are not met:**

a) Headlights

- White in color (**no exceptions**).
- Proper aiming (0 vertically, 0 horizontally preferred).
- Upper and lower beams.
- Headlights are not between 22 inches and 54 inches in height when measured from the ground to the center of headlamp.



## **LIGHTING SYSTEM - Continued**

- b) Fog Driving Lights or Auxiliary Headlight(s) OEM
  - White or yellow **ONLY**.
  - Properly aimed four (4) inches or less left to right and four (4) inches or less up to down
  - Separate switch to operate.
- c) Tail lights / Stop lights
  - Red color only. (Blue dot taillights are illegal.)
  - Two required – one on each side at the rear of each vehicle.
  - Mounted 15" to 72" in height.
- d) Turn Signal Lights
  - Required on each side of vehicle front and rear.
  - Front; yellow or amber.
  - Rear; red, yellow or amber.
  - Switch must be capable of operation by driver and remain on without assistance when activated.
- e) Instrument Panel – Interior Lights
  - Instrument panel shall be lighted whenever headlights or taillights are activated.
  - High beam indicator must indicate when high beam lights are on.
  - Turn signal indicator(s) to indicate when turn signals are in operation.
- f) Back-up Lights/License Plate Light
  - Back-up lights are not required on trailers but if present; must be white and must not be on when vehicle moves forward.
  - License plate lamp light; white without glare
- g) Clearance Lights / Marker Lights / Reflectors
  - Any light(s) or reflector(s) required under FMCSR 393.11 (See attached lighting chart).

**\*NOTE: All exterior lights must be USDOT approved and must not have tinted or colored lens covers. All required lights cannot be obscured by any part of the vehicle or its load.**

## **LIGHTING SYSTEM - (Continued)**

### **C. LIGHTING CHART-(LIGHTS REQUIRED ON ALL VEHICLES)**

**All lighting devices and reflectors required by Section 393 of the FMVSS (Federal Code) shall be operable.**

<b>LIGHT</b>	<b>LOCATION</b>	<b>HEIGHT</b>	<b>COLOR</b>	<b>NUMBER</b>
Head Lamp (not required on trailer)	Front	22" – 54"	White	2 or 4
Tail Lamp	Rear	15" – 72"	Red	2 or more
Turn Signal Lamp	Front (not less than 4" from low-beam head lamp-SE J 588e)	15" – 83"	Amber	2 or more
	Rear (not required on truck-tractor if front turn signals are double-laced and visible from the rear)	15" – 83"	Red or Amber	2 or more
Hazard Lamp (same lamp as turn signal)	Front	15" – 83"	Amber	2 or more
	Rear	15" – 83"	Red or Amber	2 or more
Stop Lamp	Rear	15" – 72"	Red	2 or more
License Plate Lamp	Rear, at license plate	-----	White	1 or more
Side Marker Lamp	Side near front	15"minimum	Amber	1 each side
	Side near rear (not required on truck-tractor)	15"minimum	Red	1 each side
Backup Lamp (not required on trailer)	Rear	-----	White	1 or more
Rear Reflector	Rear	15" – 60"	Red	2 or more
Side Reflector	Side near front	15" – 60"	Amber	1 each side
	Side near rear (not required on truck-tractor)	15" – 60"	Red	1 each side
Intermediate Side Lamp (if vehicle overall length is 30' or greater)	Side near center	15"minimum	Amber	1 each
Intermediate Side Reflector (if vehicle overall length is 30' or greater)	Side near center	15" – 60"	Amber	1 each
Parking Lamp (only if vehicle is less than 80" wide)	Front (not required on trailer)	15" – 72"	Amber or White	2 or more

**Figure T-33**

***\*NOTE: No light colors other than those described on the chart are allowed.***



## **LIGHTING SYSTEM - (Continued)**

### **D. REQUIRED ON ALL VEHICLES 80" OR WIDER**

<b>LIGHT</b>	<b>LOCATION</b>	<b>HEIGHT</b>	<b>COLOR</b>	<b>NUMBER</b>
Identification Lamp	Front, spaced 6" – 12" On center (not required on trailer)	As high as practical	Amber	3
	Rear (not required on truck/tractor)	As high as practical	Red	3
Clearance Lamp	Front, at widest point	As high as practical	Amber	2
	Rear, at widest point (not required on truck/tractor)	As high as practical	Red	2
Figure T-34				

***\*NOTE: No light colors other than those described on the chart are allowed.***

## **SECTION 8 - EXHAUST SYSTEM**

The exhaust system includes the exhaust manifold; headers, exhaust pipe, mufflers, and the tail pipes. Rusted or corroded surfaces should be given particular attention. Holes in the system made by the manufacturer for drainage are not cause for rejection.

### **A. EXHAUST SYSTEM**

1. Check the exhaust system to determine if there is leaking at a point forward of, or directly below the driver/sleeper compartment.
2. Check the bus exhaust system to determine if there is any leaking or improper discharging.
  - a. **REJECT** when:
    - 1) Gasoline powered – leak at a location in excess of six (6) inches forward of the rearmost part of the bus.
    - 2) Other than gasoline powered – leak at a location in excess of 15 inches forward of the rearmost part of the bus.
    - 3) Other than gasoline powered – any leak forward of a door or window designed to be opened. (Exception: emergency exits).
3. Check the exhaust system for correct location to determine that the system will not burn, char, or damage any electrical wiring, the fuel supply or any combustible part of the motor vehicle.
  - a. **REJECT** when:
    - 1) Vehicle has no muffler.
    - 2) There are loose or leaking joints.
    - 3) There are leaks of any kind on any part of the system including at a point forward of/or directly below the driver/sleeper compartment.
    - 4) Tailpipe is pinched.
    - 5) Any elements of exhaust system are not securely fastened.
    - 6) There is a muffler cutout or similar device.

## **EXHAUST SYSTEM - Continued**

- 7) Exhaust stacks are so located that an individual may be burned upon entering or leaving the vehicle at a location likely to cause damage to any electrical wiring, the fuel supply or any combustible part of the motor vehicle.
- 8) Any part of the exhaust system passes through the occupant compartment.
- 9) Tail pipes do not extend to or beyond the rear of the cab or passenger area.
- 10) On motor homes, vans, etc.: Tail pipe must extend to outer periphery of vehicle.

***\*NOTE: On some larger vehicles such as school buses, the extremely long piping system requires the use of flexible "slip" joints to allow for expansion and contraction. These are designed not to leak when warm.***

## **SECTION 9 - FUEL SYSTEM**

- The fuel system includes the fuel tank, the fuel pump and the necessary piping to carry the fuel from the tank to the carburetor or injection system.
- All motor fuel tanks attached to the vehicle fuel system must be secured and meet the standards as listed in FMVSS 571-301.
- National Fire Protection Association Pamphlet 52 can be purchased from <http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=52>

### **A. DIESEL / GASOLINE / LPG / NATURAL GAS**

1. Check the fuel tank, fuel tank support straps, filler tube (rubber, plastic, metal), tube clamps, fuel tank vent hoses or tubes, filler housing drain, overflow tube, fuel filler cap and conversion kit installations.

#### **a. REJECT when:**

- 1) There is fuel leakage at any point or escaping gases are detected in the system (Odor will be present).
- 2) The fuel tank filler cap / cover is missing.
- 3) Any part of the system is not securely fastened, supported or shielded to prevent damage from road hazards, slippage, loosening or rotations. (NFPA 52, 6.3)

#### **SEE NOTE BELOW.**

***\*NOTE: Make sure that the fuel tank is not exposed or unprotected. Tanks that are installed under a vehicle may not be mounted ahead of the front axle or behind the point of attachment of the rear bumper. Tanks shall be protected from physical damage using the vehicle structure, valve protectors or a suitable plastic or metal shield. A tank that is installed in the bed of a truck must be protected with a shield over the top and down any exposed sides. Shields shall be installed in a manner that prevents direct contact between the shield and the fuel tank. The shield shall also prevent the trapping of solid materials or liquids between the shield and tank that could damage the container or its coating. (NFPA 52, 6.3) SEE SHIELD SAMPLES BELOW.***



**Metal Protective Shield Sample**



**Plastic Protective Shield Sample**

## **Fuel System - Continued**

- 4) There is any physical damage to a fuel system component.
- 5) There is any installation hazard present which may cause a potential hazard during a collision.

***\*NOTE: Fuel tanks shall be permitted to be located within, below, or above the driver or passenger compartment, provided all connections to the container(s) are external to, or sealed and vented from, these compartments. All tanks that are installed in the passenger compartment shall be vented to the outside of the vehicle with a boot or heavy plastic bag and shall not exit into a wheel well. Every tank and fuel line shall be mounted and braced away from the exhaust system and supported to minimize vibration and to protect against damage, corrosion, or breakage. No part of the fuel tank or its appurtenances shall protrude beyond the sides or top of any vehicle where the tanks can be struck or punctured. (NFPA 52, 6.3) SEE VENT SAMPLES BELOW.***



**Plastic Bag Vent Sample**



**Plastic Bag Vent Sample**

## Fuel System - Continued

- 6) Vehicle is not labeled in accordance with National Fire Protection Association 52.

**NOTE: Each CNG vehicle shall be identified with a weather-resistant, diamond-shaped label located on an exterior vertical surface or near-vertical surface on the lower right rear of the vehicle (e.g., on the trunk lid of a vehicle so equipped, but not on the bumper of any vehicle) inboard from any other markings. The label shall be a minimum of 4.72 inches long by 3.27 inches high. Where a manual valve is used the valve location shall be accessible and indicated with the words "MANUAL SHUTOFF VALVE". (NFPA 52, 6.11.1) SEE CNG EXTERIOR AND MANUAL SHUTOFF LABEL SAMPLES BELOW.**



**CNG manual shut-off label sample**



**CNG exterior label sample**

**NOTE: A vehicle equipped with a CNG fuel system shall bear a label readily visible and located in the engine compartment with identification as a CNG-fueled vehicle, system service pressure, installer's name or company, container retest date(s) or expiration date and the total container water volume in gallons. There shall also be a label located at the fueling connection receptacle with identification as a CNG-fueled vehicle, system working pressure and container retest date(s) or expiration date. If both labels are located in one of the above areas, the labels shall be permitted to be combined into a single label. (NFPA 52, 6.11)**



**Engine Compartment Label Sample**



**Fueling Receptacle Sample**

## **Fuel System - Continued**

- 7) A CNG fuel container is not current on its certification in accordance with FMVSS 304. **SEE NOTE AND SAMPLE DISPLAYED BELOW.**

***NOTE: Each CNG fuel container shall be permanently labeled and should be visually inspected after a motor vehicle accident or fire and at least every 36 months or 36,000 miles, which ever comes first, for damage and deterioration. (S7.4, FMVSS 304)***

***NOTE: To locate a CNG certified inspector for a tank certification, please refer vehicle owner to: <http://webext.csa.ca/cng/cngmain.asp#searchinspector>***

A sample CNG tank certification label. The label is rectangular with a blue background and white text. It features a central white box containing the following information: 'Label Serial# P - 181540', 'Inspection Agency' (with a blank line), and 'Inspector Certificate#' (with a blank line). The label is surrounded by a border of months (JAN, FEB, MAR, APR, MAY, JUN on the left; JUL, AUG, SEP, OCT, NOV, DEC on the right) and a row of years (07, 08, 09, 10, 11, 12) at the bottom. Text on the label includes: 'This CNG cylinder must be visually inspected at no less than 36 months from the date marked. DO NOT use cylinder beyond the expiration date marked on the cylinder.' and 'Cylinder must be reinspected if overpressured, dropped, impacted, reinstalled on a different vehicle, exposed to excessive heat, fire or harsh chemicals, or if the vehicle was in an accident of 5 mph (8 kph) or more.'

**CNG tank certification label sample**

***\*NOTE: LPG and LNG leaks may accumulate at ground level. Use extreme caution when around these systems. At no time shall an inspector attempt to conduct maintenance or alterations to any alternative fuel system, unless that inspector is currently certified as an EPA alternative fuel conversion installer. Working around these systems is extremely dangerous and requires extensive training.***





## **SECTION 10-VEHICLE INTERIOR**

### **A. SEATS AND SEAT BELTS**

1. Check seats for proper operation of the adjusting mechanism and to see that the seats are securely anchored to the floor.
  - a. **REJECT** when:
    - 1) Seats are not securely anchored to floor.
    - 2) Seat adjusting mechanism slips out of set position.
    - 3) Seat back is broken or disconnected from seat base so that it will not support a person's full weight.
    - 4) Seat belts per OEM Specifications are missing or ineffective.
    - 5) Seat belts are cut, torn, frayed, or otherwise damaged.

### **B. FLOOR PAN**

1. Check floor pan in both occupant compartments and sleeper berths for rusted-out areas or holes which could permit entry of exhaust gases or which would not support occupants adequately.
  - a. **REJECT** when:
    - 1) Floor pan front or rear is rusted through sufficiently to cause a hazard to an occupant, or so that exhaust gases could enter the occupant area of the vehicle.

### **C. FRAME**

1. Check the frame. Repairs must meet OEM Specifications.
  - a. **REJECT** when:
    - 1) There are any broken, rusted through, or cracked frame components.
    - 2) Frame has been cut or portions of frame have been removed affecting the strength or integrity of the frame.

## **VEHICLE INTERIOR - Continued**

2. Check the frame for any loose, broken or missing fasteners including fasteners attaching functional components such as engine, transmission, steering gear, suspension, body parts and fifth wheel.

- a. **REJECT** when:

- 1) Frame has evidence of loose, broken or missing fasteners including fasteners attaching functional components such as engine, transmission, steering gear, suspension, body parts and fifth wheel.

### **D. WINDSHIELD WIPERS**

1. Check wipers for proper operation, for damaged, torn or hardened rubber elements of blades and metal parts of wiper blades or arms.

- a. **REJECT** when:

- 1) Either wiper fails to function properly. If vehicle was originally equipped with two windshield wipers, both must function properly.
- 2) Wiper blade(s) smear or streak windshield.
- 3) Wiper blade(s) show signs of physical breakdown of rubber wiping element.
- 4) Parts of the wiper blades or arms are missing or damaged.

### **E. WINDSHIELD WASHER SYSTEM**

1. Check for proper operation of hand or foot control and that an effective amount of fluid is delivered to the outside of the windshield.

- a. **REJECT** when:

- 1) System fails to function properly, i.e. fluid reservoir unable to hold fluid, cracked or broken hoses.

### **F. WINDSHIELD DEFROSTER**

1. Check the defroster for proper operation.

- a. **REJECT** when:

- 1) Defroster fan fails to function as designed.

## **VEHICLE INTERIOR - Continued**

### **G. SPEEDOMETER / ODOMETER**

1. Check vehicle to be sure that it is equipped with a properly functioning speedometer and odometer. (41-1a-901 UCA) Although not a cause to reject, all vehicles are required to have a working odometer in order to be registered in the state of Utah.
  - a. **ADVISE** when:
    - 1) Speedometer or odometer is not functional or is disconnected.

***\*NOTE: Although not a safety item, all vehicles are required to have a working odometer in order to be registered in the state of Utah.***

## **SECTION 11-VEHICLE EXTERIOR**

### **A. PROTRUDING METAL / PARTS AND ACCESSORIES**

1. Check for torn metal parts, moldings, etc. that may protrude from vehicle.
  - a. **REJECT** when:
    - 1) Metal, molding or other loose or dislocated parts protrude from the surface of the vehicle causing a safety hazard.
2. Check parts and accessories for proper securement
  - a. **REJECT** when:
    - 1) Parts or accessories are not properly secured.

### **B. BUMPERS**

1. Check for condition and presence of front and rear bumpers.
  - a. **REJECT** when:
    - 1) Front bumper is missing, misplaced, loosely attached, broken or torn so that a portion is protruding creating a hazard.
    - 2) Rear end protection (rear impact guards / bumpers) is missing.

***\*NOTE: Each trailer and semi-trailer with a GVWR of 10,000lbs or more, and manufactured on or after January 26, 1998 must be equipped with a rear impact guard when the bottom edge of the horizontal member of the guard and the ground exceeds 22 inches at any point across the full width of the member when the vehicle is empty. Those manufactured after December 31, 1952 (except trailers or semi-trailers manufactured on or after January 26, 1998) shall be equipped with a rear impact guard when the vertical distance between the bottom of the guard(s) and the ground does not exceed 30 inches when the motor vehicle is empty. Federal Motor Carrier Safety Regulation 393.86 requires rear end protection. (See 49 CFR 393.86)***

### **C. FENDERS**

1. Check front fenders.
  - a. **REJECT** when:
    - 1) Any fender has been removed or altered to such extent that it does not cover the entire width of the tire and wheel.

## **VEHICLE EXTERIOR-(Continued)**

### **D. DOORS**

1. Check door latches, locks, hinges and handles for proper operation, improper adjustment and broken or missing components. All doors must open and close tightly.

**a. REJECT when:**

- 1) Doors are broken or hinges are sagging so that the door cannot be tightly closed.
- 2) Doors do not open properly or close tightly.
- 3) Doors parts are missing, broken or sagging to the extent that the door cannot be opened and closed properly.

### **E. HOOD / LATCH**

1. Check hood and hood latch for proper operation.

**a. REJECT when:**

- 1) Hood is missing. Hood latch does not securely hold hood in its proper fully closed position. Secondary or safety catch does not function properly.
- 2) Latch release mechanism or its parts are broken, missing or badly adjusted so that the hood cannot be opened and closed properly.

### **F. EXTERIOR REARVIEW MIRROR(S)**

1. Check mirrors.

**a. REJECT when:**

- 1) Right or left exterior mirror is loose or missing.
- 2) Mirror is difficult to adjust or will not maintain a set adjustment.
- 3) Mirror(s) extend beyond vehicle width limit (102 inches). (Allowance should be made for truck tractors inspected without a trailer attached and the extra width the mirrors extend to provide rearward visibility around the trailer.)
- 4) Mirror is cracked, has sharp edges, is pitted or clouded to the extent that rear vision is obscured.

## **VEHICLE EXTERIOR - (Continued)**

### **G. MOTOR MOUNTS / TRANSMISSION MOUNTS**

1. Check all mount components.

a. **ADVISE** when:

1) Heat cracks are present.

b. **REJECT** when:

1) Mount bolts or nuts are broken, loose or missing.

2). Rubber cushion is separated from the metal plate of the mount.

3) There is a split through the rubber cushion.

4) Engine or transmission is sagging to the point where you hear the mount bottom out or engine misalignment to the point of drive train component compromise.

e) Fluid filled mounts are leaking (leakage must be verified from the mount)

**\*NOTE: A broken mount can cause stress on other mounts and engine compartment components.**

## **SECTION 12-WINDOWS AND GLAZING**

### **A. WINDSHIELD**

1. Windshield is required in all commercial vehicles and must have the marking AS-1, AS-10 or AS-14. Check windshield for unauthorized tinting, signs, posters or other non-transparent materials.
  - a. **REJECT** when:
    - 1) There is outright breakage (glass shattered either on the inside or outside surface or glass is broken leaving sharp or jagged edges).
    - 2) There are sandpits or discoloration which interferes with the driver's vision.
    - 3) Windshield is missing.
    - 4) Damage or repair in the acute area that is larger than one inch.
    - 5) Any intersecting cracks in the sweep of wiper blade on driver's side.

## WINDOWS AND GLAZING - Continued

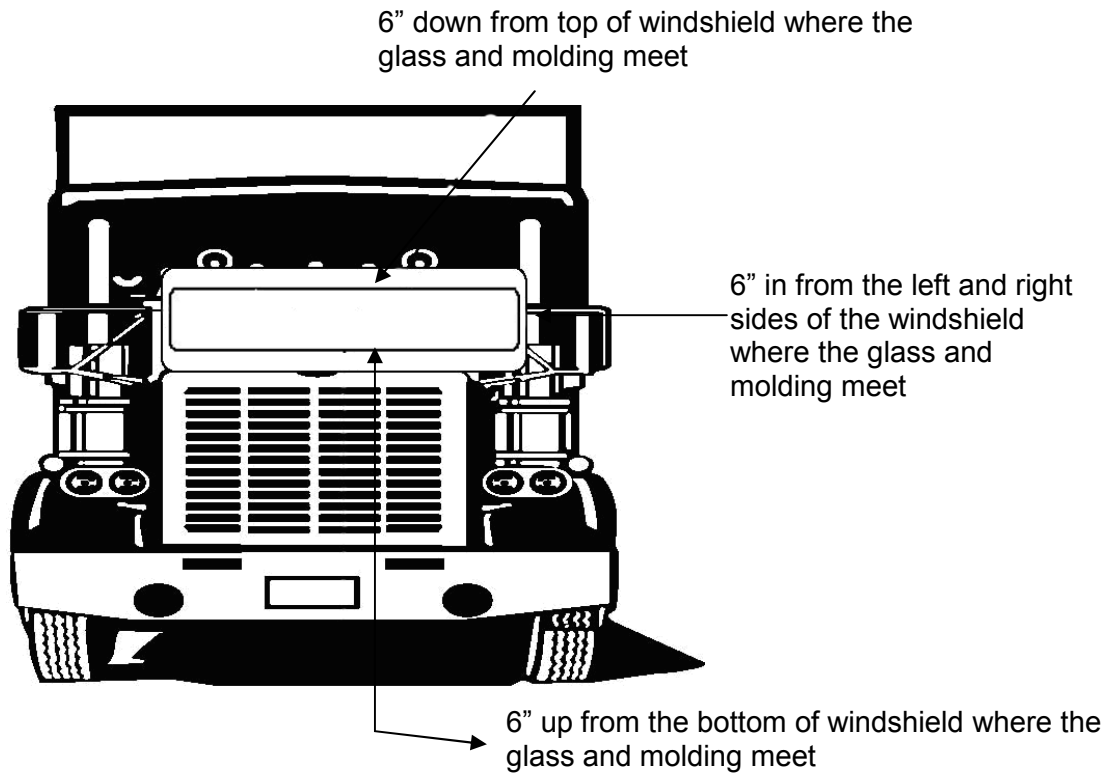


Figure T-35

**Any damage in the acute area more than one (1) inch will be cause for a reject.**



## **WINDOWS AND GLAZING - (Continued)**

### **B. VEHICLE GLAZING**

1. Check all glass for unauthorized materials or conditions that obscure driver's vision. All other glass in the vehicle must have an AS approval marking. Federal Motor Carrier Safety Regulations do not allow the front left and right side windows to be glazed/tinted darker than 70% light transmittance, see FMCSR 393.60.

- a. **REJECT** when:

- 1) Any tint or other non-transparent material has been added to the windshield below the horizontal line four (4) inches from the top of the windshield and allows less than 70% light transmittance below AS-1 mark on upper corner of windshield.
- 2) Any tinting allowing less than 70% light transmittance, or other non-transparent material, has been added to the windows to the immediate left or right of the driver's seat. (Right front or left front windows).
- 3) Any windows are covered by or treated with a material which presents a metallic or mirrored appearance when viewed from the outside of the vehicle.

**\*NOTE: Federal standards of at least 70% light transmittance apply to windshields and the driver's immediate left and right front windows.**

**\*NOTE: Effective April 2006, All light transmittance testing will have a 3% variance.**

### **C. LEFT OR RIGHT FRONT WINDOWS**

1. Check operation of window at driver's left side. Window must open readily even though the vehicle has approved turn signals.

- a. **REJECT** when:

- 1) Driver's window cannot be opened to permit arm signal.
- 2) Driver's door glass is broken, shattered or jagged.

**\*NOTE: Windows behind front driver/passenger doors are exempt from tint standards.**

**\*NOTE: Effective April 2006, All light transmittance testing will have a 3% variance.**

## **SECTION 13- SCHOOL BUS**

In addition to all other inspection items, the following are additional requirements for school buses.

### **A. SCHOOL BUS LOADING LIGHTS**

1. Check front and rear loading lights for proper operation and condition.
  - a. **ADVISE** when:
    - 1) Any lens is cracked or broken.
  - b. **REJECT** when:
    - 1) Amber or red loading light on the front or rear fails to operate.
2. Check stop arm(s) for proper operation.
  - a. **ADVISE** when:
    - 1) There is air leak from bellows.
  - b. **REJECT** when:
    - 1) Stop arm fails to extend or retract.
    - 2) More than 50% of the stop arm lights are inoperative.

### **B. SCHOOL BUS EXTERIOR CROSS VIEW MIRROR**

1. From the driver's position, visually inspect the convex cross view mirror for a clear view of the front bumper and area in front of the bus. Inspect for stable mounting, cracks and sharp edges.
  - a. **REJECT** when:
    - 1) Exterior cross view is missing.
    - 2) Mirror will not maintain a set position.
    - 3) Mirror is cracked, broken, has sharp edges, is pitted or clouded to the extent vision is obscured.

## **SCHOOLBUS - (Continued)**

### **C. EMERGENCY EXITS**

1. Check emergency exit windows for proper operation.

a. **ADVISE** when:

1) Emergency exit window warning device does not operate, if equipped.

b. **REJECT** when:

1) Emergency exit window does not open freely or completely.

2) Emergency exit window is obstructed.

2. Check emergency exit doors for proper operation.

a. **REJECT** when:

1) Emergency exit door warning device does not operate, if equipped.

2) Emergency exit door does not open freely or completely.

3) Emergency exist door is obstructed (includes when retractable seat bottom does not automatically retract and stay in the retracted position).

4) Any emergency exit door that is equipped with a padlock or similar non-OEM locking device (Excludes vehicles equipped with an interlock system).

### **D. TIRES**

1. Check tire load rating

a. **REJECT** when:

1) Tire load rating is less than required tire load rating on bus data plate.

### **E. BODY INTERIOR**

1. Check fire extinguisher, aisle clearance, handrails and seats/barriers.

a. **REJECT** when:

1) The fire extinguisher has been discharged or missing.

## **SCHOOLBUS - (Continued)**

- 2) The aisle does not have the required clearance and/or the center aisle strip is missing or not secured.
- 3) The left side handrail is missing or it has a portion of that handrail that is completely unattached from its securement position, or if it does not meet or exceed the OEM specs.
- 4) Any seat cushion or seat assembly (frame) that is completely unattached from the structure that secures it.
- 5) Any seat/barrier material so defective that it compromises the integrity of occupant protection and compartmentalization.
- 6) Driver's seat fails to adjust or hold proper adjustment.
- 7) Any part of the driver's safety restraint assembly is missing, not properly installed or so defective as to prevent proper securement.

### 2. Check step well, floors and panels.

#### a. **REJECT** when:

- 1) Any part of the step well or support structure is damaged.
- 2) Any step well condition that would present a tripping hazard.
- 3) Floor pan or inner panels having excessive perforated areas or openings sufficient to cause a hazard to an occupant.
- 4) Any panel (ceiling, side, wheel well, etc.) protruding, having sharp edges, or not secured, that may cause injuries.

## **F. BODY EXTERIOR**

### 1. Check body exterior

#### a. **REJECT** when:

- 1) Any school bus body part that is loose, torn, dislocated or protruding from the surface of the bus, creating a hazard.
- 2) School bus is any color other than school bus yellow.

## REFERENCE CHART

### English to Metric Conversion: Length

To convert inches (ins) to millimeters (mm): multiply number of inches by 25.4  
To convert millimeters (mm) to inches (ins): multiply number of millimeters by .04

Inches	Decimals	Milli- meters	Inches	Decimals	Milli- meters	Inches to millimeters		Inches to millimeters	
						Inches	mm	In	mm
	1/64	0.015625	0.3969	33/64	0.515625	13.0969	0.0001	0.00254	0.6 15.24
	1/32	0.03125	0.7937	17/32	0.53125	13.4937	0.0002	0.00508	0.7 17.78
	3/64	0.046875	1.1906	35/64	0.546875	13.8906	0.0003	0.00762	0.8 20.32
1/16		0.0625	1.5875	9/16	0.5625	14.2875	0.0004	0.01016	0.9 22.86
	5/64	0.078125	1.9844	37/64	0.578125	14.6844	0.0005	0.01270	1 25.4
3.32		0.09375	2.3812	19/32	0.59375	15.0812	0.0006	0.01524	2 50.8
	7/64	0.109375	2.7781	39/64	0.609375	15.4781	0.0007	0.01778	3 76.2
1/8		0.125	3.1750	5/8	0.625	15.8750	0.0008	0.02032	4 101.6
	9/64	0.140625	3.5719	41/64	0.640625	16.2719	0.0009	0.02286	5 127.0
5/32		0.15625	3.9687	21/32	0.65625	16.6687	0.001	0.0254	6 152.4
	11/64	0.171875	4.3656	43/64	0.671875	17.0656	0.002	0.0508	7 177.8
3/16		0.1875	4.7625	11/16	0.6875	17.4625	0.003	0.0762	8 203.2
	13/64	0.203125	5.1594	45/64	0.703125	17.8594	0.004	0.1016	9 228.6
7/32		0.21875	5.5562	23/32	0.71875	18.2562	0.005	0.1270	10 254.0
	15/64	0.234375	5.9531	47/64	0.734375	18.6531	0.006	0.1524	11 279.4
¼		0.25	6.3500	¾	0.75	19.0500	0.007	0.1778	12 304.8
	17/64	0.265625	6.7469	49/64	0.765625	19.4469	0.008	0.2032	13 330.2
9/32		0.28125	7.1437	25/32	0.78125	19.8437	0.009	0.2286	14 355.6
	19/64	0.296875	7.5406	51/64	0.796875	20.2406	0.01	0.254	15 381.0
5/16		0.3125	7.9375	13/16	0.8125	20.6375	0.02	0.508	16 406.4
	21/64	0.328125	8.3344	53/64	0.828125	21.0344	0.03	0.762	17 431.8
11/32		0.34375	8.7312	27/32	0.84375	21.4312	0.04	1.016	18 457.2
	23/64	0.359375	9.1281	55/64	0.859375	21.8281	0.05	1.270	19 482.6
3/8		0.375	9.5250	7/8	0.875	22.2250	0.06	1.524	20 508.0
	25/64	0.390625	9.9219	57/64	0.890625	22.6219	0.07	1.778	21 533.4
13/32		0.40625	10.3187	29/32	0.90625	23.0187	0.08	2.032	22 558.8
	27/64	0.421875	10.7156	59/64	0.921875	23.4156	0.09	2.286	23 584.2
7/16		0.4375	11.1125	15/16	0.9375	23.8125	0.1	2.54	24 609.6
	29/64	0.453125	11.5094	61/64	0.953125	24.2094	0.2	5.08	25 635.0
15/32		0.46875	11.9062	31/32	0.96875	24.6062	0.3	7.62	26 660.4
	31/64	0.484375	12.3031	63/64	0.984375	25.0031	0.4	10.16	27 685.8
½		0.5	12.7000				0.5	12.70	

Figure T-36

## DEFINITIONS

The following word definitions are found in the Webster's H New Riverside University Dictionary.

**ABSORB** - To take in through or as if to soak in or up. *Absorbed - Absorbing Absorbs - Absorbability.*

**ACCUMULATOR** - An automobile storage component.

**ACUTE** - Extremely serious or significant.

**ADAPTER** - A device used to effect operative compatibility between different parts of one or more pieces of apparatus.  
*Adapter.*

**ADEQUATE** - Able to satisfy a requirement.  
*Adequacy - Adequateness -Adequately.*

**ADJUSTMENT** - To change so as to match or fit. To bring into proper relationship.  
*Adjust - Adjusted - Adjusting - Adjusts Adjustable.*

**ADVISE** – “To Notify” to inform customer of items in an inspection that will pass but will need to be repaired at a later date.

**AFTER-MARKET** -The demand for goods or services associated with the upkeep of a previous purchase.

**AIR-BAG** - An automotive safety device designed to inflate upon collision and prevent passengers from pitching forward.

**ALTERED** - To make different to modify. Alter - Altering.

**ANCHORED** - Something that provides a rigid point of support, stability, or security.  
*Anchor - Anchoring - Anchors*

**ANTI-LOCK** - Computerized power surging system that keeps brakes from locking into a frozen position.

**APPLIED** - Put into practice or a particular use.

**APPROPRIATE** – Suitable; fitting.

**ASPIRATED** - To remove liquids or gases with an aspirator. *Aspirate - Aspirates Aspirating.*

**ASSEMBLY** - The combining of manufactured parts to make a completed product, esp. a machine.

**AUTOMATIC** - Acting or operating in a manner essentially independent of external influence or control. Self-regulating.

**AUXILIARY** - Giving or capable of giving assistance or support.

**AXLE** - A supporting shaft or member on which a wheel or pair of wheels revolves.

**BALL BEARING** - A friction-reducing bearing consisting of a ring shaped track containing freely revolving hard metal balls against which a rotating shaft or other part turns.

**BASE** - The lowest part of a structure as in foundation.

**BEARING** - A part supporting another machine part.

**BENT** - Not straight, crooked.

**BINDING** - To be tight and uncomfortable. To restrain.

**BLOCKS** - To support, strengthen, or retain in place by a block.

**BODY** - The passenger and cargo-carrying section of an aircraft, ship or vehicle.

**BOLT** - A fastener having a threaded pin or rod with a head at one end, designed to be inserted through holes in assembled parts and secured by mated nut that is tightened by application of torque.

**BRAKE** - A device for reducing or stopping motion, as of a vehicle, esp. by contact friction.

**BRAKE DRUM** - A metal cylinder to which pressure is applied by a braking mechanism so as to arrest rotation of the wheel or shaft to which the cylinder is attached.

**BRAKE FLUID** - Liquid used in a hydraulic brake system.

**BRAKE LINING** - The covering of a brake shoe or pad.

**BRAKE PAD** - A flat block brake lining that presses against the disc of a disc brake.

**BRAKE SHOE** - A curved block, attached to the brake lining, that presses against and reduces or stops the rotation of a wheel or shaft.

**BROKEN** - Forcibly fractured into pieces; shattered.

**BULGES** - A protruding part, as an outward curve or swelling.

**BUMP** - To cause to knock against an obstacle; displace.

**BUMPER** - Either of two metal structures, typically horizontal bars, attached to the front and rear of a car to absorb the impact of a collision, a protective device used to absorb shocks

**BUSHING(S)** - A fixed or removable lining used to constrain, guide, or reduce friction.

**CALIBRATE** - To check, adjust or standardize systematically the graduations of a quantitative measuring instrument.

**CALIPER** - An instrument composed of two curved hinged legs, used for measuring internal and external dimensions.

**CERTIFICATE** - A document testifying to accuracy or truth.

**CHAFED** - To wear away by friction or irritation.

**CHASSIS** - The rectangular steel frame, supported on springs and attached to the axles, that holds the body and engine of an automotive vehicle.

**CIRCUMFERENCE** - The boundary line of a circle.

**CLAMP** - A device for joining, gripping, supporting or compressing structural or mechanical parts.

**CLEAR(LY)** - Free from what dims, obscures or darkens: Transparent.

**CLOUDED** - A dark blemish or spot, something that obscures.

**COIL** - A series of connecting spirals or connecting rings formed by winding or gathering.

**COLLAPSE** - An abrupt failure of function, strength.

**COMPONENT** - A constituent element, as of a system, a part of a mechanical or electrical complex.

**COMPUTERIZED** - Of or relating to a computer or the use of a computer.

**CONTAMINATED** - To make impure by mixture or contact.

**CORRODE** - To dissolve or eat away gradually by chemical reaction like rust.

**CRACKS** - To break without dividing into parts.

**CRIMPS** - To press or pinch into small regular ridges or folds.

**CUSTOM** - Specializing in the selling of made-to-order goods.

**CUTS** - To separate into parts with or as if with a sharp-edged instrument; sever.

**CYLINDER** - The chamber in which a piston of a reciprocating engine moves.

**DAMPING** - The capacity built into a mechanical or electrical device to prevent excessive correction and the resulting instability or oscillatory conditions.

**DAMPEN - DAMPENING** - To make slightly wet, moisten.

**DAMAGE** - Impairment of the usefulness or value of person or property.

**DEFECTS**, defective - A fault or imperfection: having a defect: faulty.

**DEFROSTER** - A heating device designed to remove ice or frost or prevent its formation.

**DEPRESS** - To push down.

**DETERIORATED** - To lower or impair in quality, or value.

**DIAMETER** - A straight segment passing through the center of a figure, esp. of a circle or sphere, and terminating at the periphery.

**DISCONNECT** - To interrupt or break the connection of or between.

**DISCOLORED** - To spoil or alter the proper color of stain; to become faded.

**DISLOCATED** - To displace from the proper or usual relation- ship with adjoining parts.

**DISTORTION** - To twist out of proper shape or relation; to contort.

**DRAG** - To cause to move with great reluctance, weariness, or difficulty.

**ELECTRICAL** - Of, relating to, or operated by electricity.

**ELONGATED** - To make or grow longer, extended, lengthened.

**ENGINE** - A machine that converts energy into mechanical motion.

**ERRATIC** - Lacking regularity, consistency, or uniformity.

**ETCHING** - To cut into the surface by the action of acid, printing designs or pictures.

**EXCESS** - An amount beyond the normal, sufficient, required or appropriate. Greater or more than the requirement.

**EXPOSED** - To remove protection from, the act of making visible.



**EXTEND** - To stretch or spread out to full length.

**EXTERNAL** - An exterior surface or part.

**FAILURE** - A cessation of proper functioning, a decline in strength or effectiveness.

**FENDERS** - A metal guard over the wheel of an automotive vehicle.

**FLEXIBLE** - Capable of being bent or flexed; pliable.

**FLUSH** - To be cleaned by a rapid brief gush of water.

**FMCSA** – Federal Motor Carrier Safety Administration

**FMVSS** - Federal Motor Vehicle Safety Standard

**FORCE** - To compel through pressure or necessity; to move against resistance.

**FRAME** - A skeletal structure designed to shape and support.

**FRAYED** - To wear away by rubbing, a frayed spot as on fabric.

**FRICTION** - The rubbing of one object or surface against another.

**FROZEN** - Rendered immobile.

**FUNCTIONAL** - Designed for or adapted to a specific function or use. To have or perform a  
**GASKET** - A seal or packing used between matched machine parts or around pipe joints to prevent the escape of a gas or fluid.

**HEAVY TRUCK**- Covers vehicles from 26,001 lbs and up.

**HEIGHT** - The distance from the base to the top of an object.

**HORIZONTAL** - Parallel to or in the plane of the horizon.

**HYDRAULIC** - Of, involving, moved, or operated by a pressurized fluid, esp. water.

**ILLEGAL** - Forbidden by law, by official rules. function.

**INDICATOR** - An instrument as a meter or a gauge for monitoring the operation or condition of a physical system, as an engine.

**INOPERATIVE**- Not working or functioning.

**INSTABILITY** - Lack of stability.

**JAGGED** - Having sharp or ragged projections on a surface or edge.

**JAMMING** - To activate or apply suddenly, as automotive brakes. To cause to lock in inoperable position.

**JOINT (S)** - A point or a position at which two or more things are joined. A configuration in or by which two or more things are joined.

**KINKED** - A tight curl or sharp twist in a wire-like material, typically caused by the tensing of a looped section.

**KNOT, knots** - A compact intersection or interlaced material, as cord, ribbon, or rope. To tie in or become entangled.  
**LAMINATED** – Made up of bonded layers.

**LAMP** - A device that generates, heat, light, or therapeutic radiation

**LATCH, latching** – To close or lock with or as if to latch.

**LEAF SPRING** - A composite spring used especially in automotive suspensions, consisting of several layers of metallic strips joined to function as a unit.

**LEAK, leakage** - To allow the passage or escape of something through a breach or flaw. A crack or opening that permits something to escape from or enter a container or conduit.

**LENS** - A carefully ground or molded piece of glass, plastic, or other transparent material with opposite surfaces either or both of which are curved by means of which light rays are refracted so that they converge or diverge to form an image.

**LEVERAGE** - The action of a lever. The mechanical advantage of a lever.

**LINKAGE** - A system of interconnected machine parts, as rods, springs, and pivots, for transmitting power or motion.

**LOOSE** - looseness - Not tight fitting, not bound, stapled, bundled or gathered together.

**MALADJUSTMENT** - Faulty adjustment as in a machine.

**MECHANISM** - Mechanical device, and arrangement of machine parts.

**METALLIC** - Of, relating to or having the characteristics of a metal.

**MINIMUM** - The least possible quantity or degree. The lowest amount or degree reached.

**MIRRORED** - A surface able to reflect enough undiffused light to form a virtual image of an object placed before it.

**MISPLACED** - To put in wrong place.

**MODIFIED** - To change in form or alter. To make less extreme, severe or strong.

**MOTORCYCLE** - means a motor vehicle, other than a tractor, having a saddle for the use of the rider and designed to travel with not more than three wheels in contact with the ground.

**MOVEMENT**- A mechanism that produces or transmits motion.

**MUFFLER** - A device that absorbs esp. one used with an internal combustion engine.

**OBSCURED** - Deficient in light, dark. Lacking a clear delineation, indistinct.

**OEM** - Original Equipment Manufacturer.

**PASSENGER VEHICLE / LIGHT TRUCK**- Covers vehicles up to 26,000 lbs.

**PAWL** - A hinged or pivoted device adapted to fit into a notch of a ratchet wheel to impart forward motion or prevent backward motion.

**PERIPHERY** - The outermost region or part within a precise boundary.

**PIT, pitted** - A natural depression or small indentation on a surface. To make cavities, depressions or scars.

**PLEXIGLAS** - A trademark for a light, transparent, weather-resistant thermoplastic.

**PRESSURE** - An application of continuous force by one body on another that it touches.

**PROTRUDE** - To push or thrust outward, to jut out.

**PUMP, pumping** - A device or machine for transferring a gas or liquid from a source or container through tubes or pipes to another container or receiver.

**RATCHET** - A mechanism consisting of a pawl that engages the sloping teeth of a bar, or wheel, of a ratchet.

**RATING** - To specify performance limits.

**REFLECT** - To throw or bend back light.

**RE-INSPECTION** means an inspection of previously rejected items that is completed within fifteen days of the original inspection.

**REJECT** – To deny a vehicle to pass an inspection with safety items that fail to function properly.

**RESERVOIR** -A receptacle for storing a fluid.

**RESTRICT**, restricted - To hold within limits, to confine.

**RIM** - The circular outer part of a wheel , furthest from the axle. A circular metal structure around which a wheel tire is fitted.

**RIVET** - A metal bolt or pin having a head on one end, used to fasten metal plates or other objects together by inserting the shank through a hole in each piece and hammering down the plain end so as to form a new head.

**ROTOR** - A rotating part of an electrical or mechanical part.

**RUB/rubbing** - To subject to the action of something that moves back and forth with friction and pressure.

**SAGGING** - To lose strength, firmness, or resilience.

**SEAL/SEALED** - An adhesive agent used to close or secure something or prevent seepage of moisture or air.

**SECURE, secured** - Not likely to fail or give way, stable, well-fastened.

**SEEP, seepage** - to pass slowly through small openings or pores. Something that has seeped.

**SEIZE, seizing** - To fuse or cohere with another part due to high pressure or temperature, slowing or stopping further motion.

**SCRATCH, scratched** - To make a narrow line or mark with a sharp instrument. To scrape or strike on an abrasive surface.

**SEVERE** - Corresponding strictly and rigidly to established rule.

**SEVERED** - To become cut or broken apart.

**SHACKLE** - A device used to fasten or couple. (Shackles, something that restrains or confines.)

**SHADE, shaded** - Light reduced in intensity due to interception of the rays; partial darkness. To obscure or to darken.

**SHATTER, shattered** - To cause to break or burst suddenly into pieces. A fragmented or splintered condition.

**SHIMMY** - Abnormal vibration, as in the chassis of a motor vehicle.

**SLIP, slippage** - To move quietly and smoothly, glide. To cause to move in a smooth easy or sliding motion.

**SMEAR** - To stain by or as if by spreading or daubing with a sticky, greasy or dirty substance.

**SNAG** - A sharp rugged, or jagged protuberance.

**SPECIFICATIONS** - An exact written description of an item.

**SPRINGS** - An elastic device, as coil or wire that regains its original shape after removal of stress.

**STABILITY** - Resistance to sudden change, dislodgement, or overthrow. Reliability, dependability.

**STEEPING** - To direct the course, to maneuver, to guide a vessel or vehicle.

**STRUT** - To brace with a supporting bar or rod.

**SUSPENSION** - The system of springs that protects the chassis of a motor vehicle from shocks transmitted through the wheels.

**SWITCH** - A device for breaking or opening an electrical circuit or for diverting current from one conductor to another.

**SYSTEM** - A group of interacting mechanical or electrical components.

**TENSION** - A force tending to stretch or elongate something, the measure of such force.

**TILT** - To cause to slope as by raising one end.

**TINT, tinting** - A shade of a color, a slight coloration, a shaded effect. To give a tint or take on a tint.

**TORSION BAR** - A part of an automotive suspension consisting of a bar that twists to maintain stability

**TRACK** - To keep a constant distance apart; Used as a pair of wheels. To be in alignment.

**TRANSMISSION** - An automotive assembly of gears and associated parts by which power is transmitted from the engine to a drive shaft.  
**TRAVEL** - To move from one place to another.

**TREAD** - The grooved face of a tire.

**U-BOLT** - A bolt shaped like the letter "U", fitted with threads and a nut at each end.

**UNLADEN** - Without load.

**USDOT** - United States Department of Transportation.

**VACUUM** - A state of being sealed off from external or environmental influences.

**VALVES** - A device that regulates the flow of gases, fluids or loose materials through a pipe, the moveable control element.

**VERTICAL** - Being at right angles to the horizon.

**VINTAGE VEHICLE** - means a motor vehicle that is 40 years old or older, from the current year, primarily a collector's item, and used for participation in club activities, exhibitions, tours, parades, occasional transportation, and similar uses, but that is not used for general daily transportation. UCA 41-21-1

**VISUAL** - Capable of being seen by the eye.

**WEEPING** - To ooze, exude, or let fall drops of liquid. Drops of moisture.

**WEIGHT** - A measure of the heaviness or mass of an object.

**WELDED** - To join metals by applying heat, sometimes with pressure and sometimes with an intermediate or filler metal having a high melting point.

**WIDTH** - The measurement of the extent of something from side to side.

**WORN** - Affected by use or wear, impaired, damaged, or showing fatigue by use or wear.

## Index by Subject

Axle beam .....	15	windshield .....	64
Brakes		Headlights .....	45
adjustment limit clamp type .....	35	colors .....	47
adjustment limit long stroke clamp .....	36	Hood	
adjustment limit rotochamber type .....	35	latch .....	60
breakaway .....	28	missing .....	60
drums .....	30	Horn .....	43
hoses .....	31	Leaf spring.....	See Suspension
low air warning.....	40	License plate	
required on trailers.....	28	number of.....	7
rotors .....	30	License Plate	
tractor protection valve.....	32	covers .....	7
tubing.....	31	lighting .....	46
vacuum system.....	34	mounting .....	7
wedge.....	29	Lighting	
wheel seals.....	34	auxiliary.....	45
Bumpers.....	59	back-up.....	46
Converter Dolly Diagram .....	27	clearance .....	48
Defroster .....	57	color of auxiliary .....	46
Doors .....	60	color of headlights.....	46
Drawbar		color of taillights .....	46
diagrams.....	26	color of turn signals.....	46
eye.....	26	driveing lights.....	46
Electrical		instrument panel .....	46
automatic transmission starting switch .	44	license plate .....	46
connections .....	43	marker .....	46
switches .....	43	taillights.....	46
wiring .....	43	turn signals .....	46
Exhaust		Mirrors	
gasoline .....	49	cracks .....	60
leaks .....	49	Motor mounts .....	61
muffler .....	49	Mud flaps.....	See Mudguards
Fenders.....	59	Mudguards .....	8
Fifth wheel		exceptions.....	8
kingpin diagram .....	27	Muffler .....	49
Fifth Wheel		Pintle hook.....	23
lower coupler .....	23	cracks .....	23
upper plate diagram .....	27	mounting .....	23
Floor pan .....	56	Registration papers .....	7
Frame		Rims .....	See Tires and Wheels
cracks .....	56	Safety chains.....	See Safety Devices
Frames		Safety Devices	
fasteners.....	57	cables .....	25
Fuel system.....	51	chains .....	24
Glass.....	See Windows and Glazing	Seat belts .....	56
Glazing		Shear capsule .....	14
side windows .....	64	Splash aprons .....	See Mudguards

Steering			
ball and socket joints .....	16		
drag links .....	17		
gear box .....	15		
linkage play.....	19		
pitman arm.....	15		
pittman arm diagram .....	17		
steering gear diagram .....	15		
system .....	16		
system components diagram .....	17		
tie rods.....	17		
Steering wheel			
column.....	14		
Steering Wheel			
looseness in.....	13		
Steering wheel			
lash.....	13		
Studs			
missing .....	11		
out-of-round .....	11		
Suspension			
air .....	20		
coils .....	20		
leaf springs .....	20		
shocks .....	21		
u-bolts.....	14		
Suspension Steering			
torsion bar.....	20		
Switch			
automatic transmission .....	44		
Switches.....	43		
Tail lights.....	46		
Taillights			
color.....	46		
Tinting .....	See Glazing		
Tire			
weight exceeds limit.....	9		
Tires			
all other types .....	10		
duals .....	10		
duals touching.....	10		
fenders.....	59		
<u>front steer less than 4/32"</u> .....	8		
front steering axle .....	8		
mixed type on steering axle.....	10		
re-capped on bus .....	9		
re-grooved on front steering .....	9		
size .....	11		
valve stems.....	11		
Tow-bar .....	See Drawbar		
Turn signals.....	46		
color .....	46		
VIN verification .....	7		
Wheel			
tracking .....	21		
tracking components .....	21		
Wheel seals.....	34		
Wheels			
cracks .....	11		
studs .....	11		
wheel rings.....	11		
Windows			
front sides .....	64		
glazing .....	See Glazing		
Windshield			
defroster.....	57		
glazing .....	64		
washer system .....	57		
wipers .....	57		